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The Atlantic

DAVID OWEN ON XEROGRAPHY / A SOUTH AFRICA STORY BY ERNST HAVEMANN

The Origin of Petroleum

*A maverick theory, infuriating to geologists, implies
virtually limitless stores of energy*

By David Osborne



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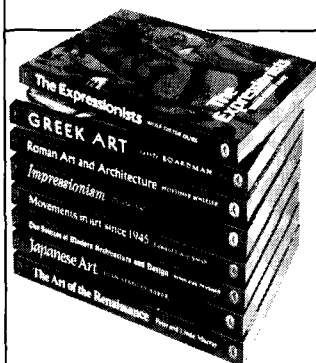
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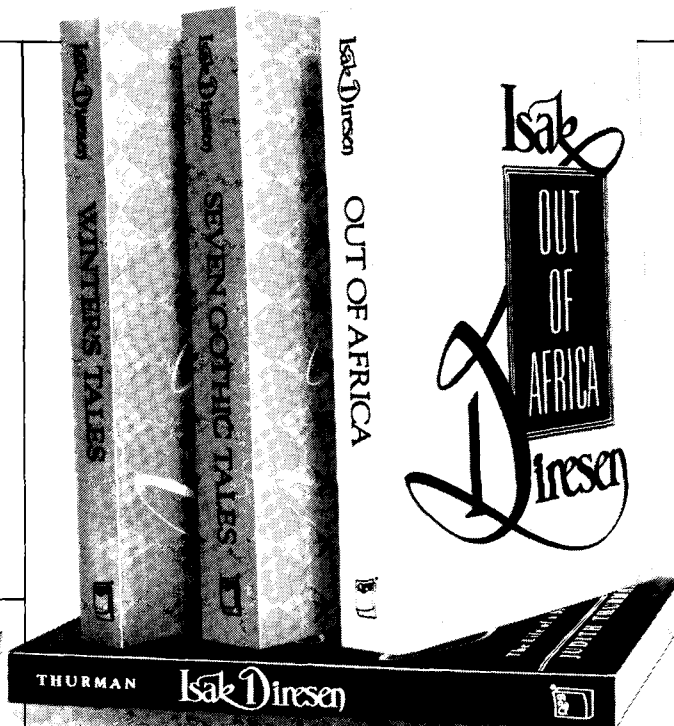


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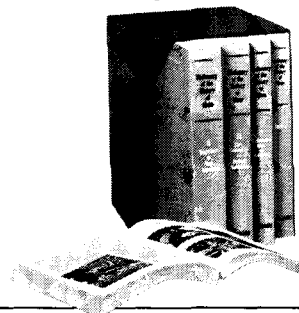
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DAVID BOTTOMS ("Under the Vulture-Tree"), an assistant professor of English at Georgia State University, will spend this spring as the Richard Hugo Writer-in-Residence at the University of Montana. He is the author of several books, including *Jamming With the Band at the VFW* (1978), *Shooting Rats at the Bibb County Dump* (1980), and, most recently, *In a U-Haul North of Damascus* (1983), which was named Book of the Year in Poetry by the Dixie Council of Authors and Journalists.

PABLO NERUDA ("Love Sonnets") received the Nobel Prize for Literature in 1971. His books include *Veinte poemas de amor y una canción desesperada* (1924), *Residencia en la tierra* (1933-35), *Canto general* (1950), and the autobiographical *Memorial de Isla Negra* (1964). Neruda died in 1973. The translator, Stephen Tapscott, is an associate professor of literature at the Massachusetts Institute of Technology. His translation of Neruda's *Cien sonetos de amor* (*One Hundred Love Sonnets*, 1959) will be published this spring by the University of Texas Press.

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LETTERS TO THE EDITOR

AGAINST CREDENTIALISM

James Fallows's "The Case Against Credentialism" (December *Atlantic*) is one of the best discussions of the subject I've come across. One point that Mr. Fallows does not make seems to me worth mentioning. It's true, as he reports, that in *The Achieving Society*, David McClelland focused upon the "need for achievement" as a crucial motive in many individuals and cultures. But in "Power is the Great Motivator," an article published in the *Harvard Business Review* in 1976, McClelland and David Burnham, a management consultant, presented evidence that the need for achievement tends not to be a distinguishing characteristic of successful managers in large enterprises.

The need for achievement, defined as "the desire to do something better or more efficiently than it has been done before," does seem to distinguish people who successfully launch their own small businesses. But "what has achievement motivation got to do with good management?" McClelland and Burnham ask. "There is no reason on theoretical grounds why a person who has a strong need to be efficient should make a good manager."

Indeed, they go on to argue, the achievement motive "leads people to behave in very special ways that do not necessarily lead to good management." People who are driven by the desire for personal achievement tend to want to do things themselves: it is their achievement that interests them. Yet, especially in large enterprises, "the manager's job seems to call more for someone who can influence people than for someone who does things better alone." The most successful managers, McClelland and Burnham conclude, possess "a high need for power and an interest in influencing others," but the need for power must be "socialized"—"disciplined and controlled so that it is directed toward the benefit of the institution as a whole and not toward the manager's personal aggrandizement." All of this may help to explain the difficulties that many MBAs seem to experience when they finally emerge from the academic cocoon. High achievers in school tend to be people who excel at managing a single re-

source—themselves. What distinguishes them is the high quality of the work that they produce sitting alone at their desks. Why should anyone expect such people to flourish when, suddenly, success depends not on their ability to manage themselves but on their ability to motivate and manage a group?

PETER BAIDA
New York, N.Y.

The cult of credentialism, as James Fallows so ably recounts, is deeply embedded in our society. It would take a generation or more to democratize our professions and attain the ideal meritocracy he favors.

But then, even if we could install these reforms overnight and raise the quality of professionals, the quantity—already excessive—would continue to increase. That runaway growth, not credentialism, is the real problem. America's monumental investment in its legions of MBAs, attorneys, accountants, doctors, money managers, and their supporting infrastructure has yielded little of value in the global marketplace. A similar investment in skills that create tradable goods and services could have saved us from the ignominy of debtors' status.

How can an increasingly professionalized America, convinced that competition is fit only for an uncredentialed underclass, match nations that glorify competitive skill? A society that segregates its best and brightest into a privileged caste, so obviously ill equipped to defend its heritage in a global arena, will self-destruct.

HENRY FOGEL
King's Point, N.Y.

Congratulations on publishing "The Case Against Credentialism." You have here one of the most important but least recognized reasons for U.S. industry's preoccupation with getting by through manipulating money instead of through meeting people's needs. The paper barriers lock out from decision-making jobs immense numbers of people made for those jobs—probably most of our potential Thomas Edisons, Henry Fords, and Charles Wilsons. This is a terrible waste of human resources and a terrible denial of constructive outlets for

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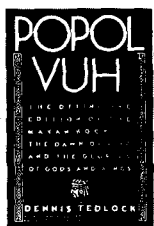
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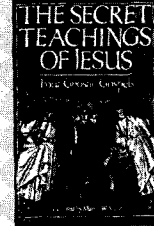
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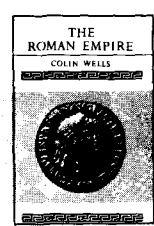
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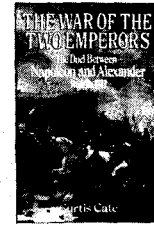
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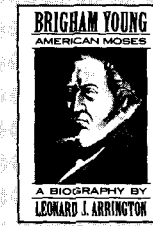
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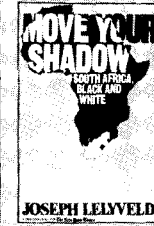
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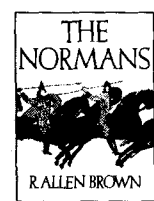
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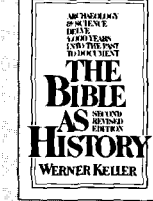
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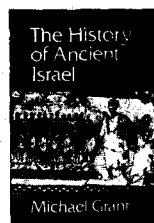
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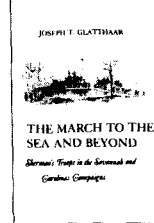
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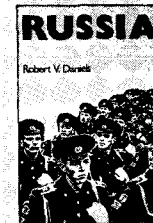
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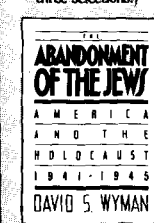
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the energies of highly motivated people, some of whom, in frustration, no doubt find destructive outlets.

EDGAR R. JONES
Englewood, Fla.

In support of Mr. Fallows's persuasive argument against empty credentialism I point to the Navy's growing reliance on noncommissioned officers. These men, who have typically worked their way up from the lowest enlisted ranks, are becoming the backbone of the officer corps. Limited-duty officers and chief warrant officers generally lack college degrees but abound in motivation and experience. I attended Officer Candidate School in Newport, Rhode Island, in 1981, and graduated with the first officer sent directly from the fleet to the commissioning program, bypassing the college-degree requirement. I have no doubt that his achievements have surpassed those of most of his classmates.

JONATHAN B. BRITTEN
Memphis, Tenn.

Fallows's article may be construed as having opened a case for credentials. The cover illustration depicts a thinly disguised caduceus, the symbol of medicine. Fallows correctly observes that a medical license is no guarantee of competence, but he fails to examine the most vital credential held by medical and surgical specialists—that is, certification by a specialty board recognized by the American Board of Medical Specialties. Board certification requires not only academic performance but also clinical competence judged by a panel of one's betters. Wise state licensing is the least of a fully certified physician's qualifications to practice: board certification and academic performance are at the top.

FRANK WELSH, M.D.
Cincinnati, Ohio

James Fallows's provocative article overlooks one fundamental dynamic of the American economic system: it's who you know. As C. Wright Mills and William G. Domhoff, among others, have pointed out, capitalism thrives on the interrelationships of the elite class. And, as these sociologists observed, a primary breeding ground for elites is the prestigious educational institutions of our country. If this leftist interpretation of power in this country is accurate, it makes perfect sense for companies to hire credentialed individuals, not for

their presumed knowledge or experience but for the contacts they've made at school.

MARK HALL
San Francisco, Calif.

James Fallows replies:

I agree with Frank Welsh that board certification, which measures traits beyond academic performance, is a valuable measure of competence. But why not extend its logic further? Why not require physicians to re-demonstrate their competence at regular intervals, as airline pilots must? Is it conceivable that doctors, unlike pilots, suffer absolutely no fall-off in proficiency as the years go by? If the certifying boards really do measure what matters in medical practice, then why not give a license to anyone who can meet their standards—including those who started as nurses or did not take the normal path through medical school? Would this be so much graver a risk to the public safety than the current system, in which, as I mentioned in my article, a psychiatrist is legally entitled to perform surgery on your knee?

From my days as a Boy Scout, I know that strong swimmers are not allowed to get the lifesaving badge nor good cooks the cooking badge until they have achieved the rank of First Class Scout. For the Boy Scouts this makes sense, because it gives the boys something to keep looking forward to. In caricature form, the credential system works the same way—you can't get your merit badges (professional positions) until you've become a First Class Scout (graduated from college or professional school). Does such an arrangement make sense for grown-ups?

I agree with Mark Hall, too: it matters who you know. But it seems to me that the growth of credential requirements is an independent, important phenomenon. Most private schools hire French teachers who have studied French and history teachers who have studied history—whether or not they have received degrees from education schools. Public schools, of course, require that their teachers hold education certificates; their insistence on this credential can't really be explained as a manifestation of "the interrelationships of the elite class."

I thank Peter Baida, Edgar Jones, and Jonathan Britten for their examples; I wish I had known of them three months ago.

THE ENDLESS SIEGE

Conor Cruise O'Brien missed one important point in his explanation of why Israel will not relinquish control of East Jerusalem ("Why Israel Can't Take 'Bold Steps' for Peace," October *Atlantic*). Since 1967 members of all religions have had access to their holy places, which are well maintained and protected. Before 1967 Jews were denied entry to the Wailing Wall and the Temple mount, and Jewish cemeteries and synagogues were desecrated. Neither Israelis nor Jews elsewhere in the world will allow this to occur again: therefore, East Jerusalem cannot be entrusted to any other power.

MEREDITH WARSHAW
Waltham, Mass.

Conor Cruise O'Brien suggests that the most likely terms of a new "territory for peace" idea would involve Israel's "Labour alignment with the two dovish parties to the left of it—Shinui and the Citizens' Rights Movement."

But Menachem Begin, the Likud leader, not renowned for his dovish attitudes, was the man who signed the peace treaty with Anwar Sadat, which gave back the Sinai Peninsula. I'd venture that any Labour politician who tried that would have been committing political suicide.

ARTHUR CHAPMAN
Winnipeg, Manitoba

Conor Cruise O'Brien replies:

I don't think anyone who has studied the statements of Likud leaders believes that Likud could or would ever agree to surrender territory on the West Bank. Sinai is not a valid precedent, because Sinai was not considered by Likud to be an inalienable part of Israel, as were Judea and Samaria. And Begin, in concluding the agreement with Sadat, probably reckoned—it is a rational reckoning—that by removing the strongest Arab state from the circle of Israel's enemies he was strengthening, not weakening, Israel's title to Judea and Samaria.

PUNISHMENT VS. DISCIPLINE

Bruno Bettelheim's article "Punishment Versus Discipline" (November *Atlantic*) was both lucid and enlightening. I have misgivings, however, about Dr. Bettelheim's implied response to his own question, "Would it not have been

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better, from the standpoint of deterrence and moral growth, if the child had had to struggle longer with his guilt?"

Although guilt may be better than "the fear of punishment" and "a much better and more lasting deterrent," it still falls short of a desired method of discipline. Guilt is more than "the pangs of conscience." I believe that a period for deliberation is fine—heated emotions are shelved and cooled, thereby keeping anger out of the disciplining process and allowing rationality to return—but to foster a child's sense of guilt for the purpose of making an impression is psychological punishment, and not that far removed from fear and pain as methods of disciplining.

Guilt leads to self-reproach, which in turn leads to emotional pain. Pain, fear, and guilt are all barriers that work to impede and sometimes cripple healthy development. If a child is occupied with sorting out emotional problems (real or imagined—they're indistinguishable to a child), then although he/she might be temporarily deterred, he/she certainly won't be of a mindset that's receptive to moral growth.

J. A. MELZER
Norfolk, Mass.

I expect to think further about, and rely on, Bruno Bettelheim's article often in the years ahead, as my infant daughter grows up. However, I disagree now with Bettelheim's suggestion that we should not be more severe with our children than the law would be. As a lawyer, I respect the law as the way society governs itself. However, much of the law is merely the lowest common denominator of acceptable conduct. I try to do what I think is right (for example, recycling) whether the law requires it or not. I hope we raise our daughter to do the same.

ARTHUR P. KREIGER
Cambridge, Mass.

TV PROBLEMS

David Denby is critical of Neil Postman's book *Amusing Ourselves to Death* because it is, among other things, "humorless" ("All the World's a Tube," November *Atlantic*). It's hardly likely that Postman intended that it be a rib-tickler.

Mr. Postman is doing a service by pointing to the destruction that television has wrought intellectually, political-

ly, and culturally. Television damages the ability of little children to learn in two ways: it plays havoc with the development of their attention span for non-visual experience, like reading, and it cripples their ability to decode the written symbol into recognizable ideas. As if this were not enough, the undifferentiated pabulum that constitutes most television fare for adults is interrupted at regular intervals, thereby numbing emotional expression and response.

Unless there is a substantial moderation of television viewing, we will become a nation of mindless "feelgoods." Jeremiads like Mr. Postman's are in short supply.

SYLVIA DAY
Woodstock, N.Y.

David Denby replies:

I don't necessarily disagree with Mr. Postman's position, or Ms. Day's. The point of my review was that Mr. Postman did not make his case.

SOCIAL SECURITY

James Fallows keeps writing about Social Security, and he keeps getting it wrong. His reply to Albert Carr ("Letters to the Editor," November *Atlantic*) artfully concedes that present Social Security payroll-tax receipts fully cover benefit costs, hence Social Security is not a part of today's "fiscal crisis." But, Fallows asserts, the equilibrium will not last: "Beginning in 1990, the total tax will be more than 15 percent, and unless the economy (or the taxpaying population) grows much faster than is now generally foreseen, the rate will have to be raised higher still." While the actual claim made in this sentence is both vague and modest, the impression fostered is of a "generally foreseen" long-term crisis.

Generally foreseen by whom? The official forecasts show a rising trust-fund surplus under current statutes for roughly the next quarter century, with a gradual decline in the surplus after that. One can dispute the assumptions behind those forecasts—as, for example, the National Taxpayers Union (NTU) likes to do. Still, most professional opinion does not regard them as corrupt or even, allowing for the fact that the future is inherently unknowable, as unreasonable. The impression that Social Security experts generally foresee a crisis is false.

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If, as Fallows and the NTU expect, economic performance does turn out badly after all, the effects will not be confined to Social Security. In that case, actually, revenue shortfalls will be greater in the general fund than in the trust funds, because income and indirect business taxes are more elastic with respect to economic performance than payroll taxes are. So even in this grim scenario the emphasis on cutting Social Security benefits is misplaced.

JAMES K. GALBRAITH
Austin, Tex.

James Fallows replies:

What are the economic assumptions on which James Galbraith's Social Security projections are based? The famous "Intermediate-B" assumptions, which have given rise to forecasts of a huge surplus and cover the years from the early 1980s through the middle of the next century, are as follows: Unemployment will fall to 5.5 percent by 1995—and stay there for the next sixty years. The rate of increase in the consumer price index—that is, inflation—will be 4.0 percent by 1995, and will stay there. The gross national product will increase at an average rate of 2.6 percent a year, after inflation, for twenty years and then dip to 1.9 percent. The "total fertility rate"—the number of children the average woman bears during her lifetime—will rise to 2.0 and stay there.

These assumptions may, of course, prove too dour. The gross national product has historically grown faster than the forecast rate. However, in only one year since 1970 has the annual unemployment rate been as low as the rate that is forecast for a sixty-year spell. In no year from 1968 to 1983 was inflation as low as 4.0 percent. Fertility rates would have to reverse their decades-long decline, or immigration would have to step up dramatically, for the population forecast to come true. None of this makes the assumptions "corrupt," but to many economists I have spoken with it makes them "optimistic."

Moreover, even if the forecasts prove to be perfectly correct, the huge surplus will be used up when the Baby Boom generation has retired. It is a "surplus" only in the sense that money set aside in private pension funds is; the money is obligated to meet claims of people already born.

Why am I harping on Social Security? Because taxes for Social Security and Medicare have risen so dramatically that

most Americans pay more in regressive payroll taxes than they do in income tax. The payroll-tax rates are so high partly in order to guarantee every future retiree, including John D. Rockefeller IV and Joseph Kennedy III, his Social Security check. Why not give less money to people who don't need it, so that we can take less money from people who have other bills and taxes to pay?

READING WILL DURANT

In "The Venerable Will" (November *Atlantic*) Cullen Murphy asks, "Has anyone actually read *The Story of Civilization*—gone the whole yard from *Our Oriental Heritage* (1935) to *The Age of Napoleon* (1973)?" I should like to inform him that my husband and I belong to a book club having eight members. We have been meeting monthly for more than twenty years to discuss previously voted upon selections. Many years ago we decided to discuss one volume of the Durant series each year. We generally devoted three-day-weekend meetings to that enterprise. Having finished the project in 1977 (we read *The Reformation* volume twice), we are ready to start over again.

SYLVIA SPECTOR LAMONT
Gardena, Calif.

I had just squandered \$29.95 on the Book of the Month Club version of Will Durant's *Story of Civilization* when I noticed Cullen Murphy's "The Venerable Will." So I read it with interest. I'll read with even more interest Mr. Murphy's answer to the following question: Where should poor fools like me turn to learn some history?

ROBERT CHAPMAN WOOD
Scituate, Mass.

Cullen Murphy replies:

William H. McNeil's many fine books cover a substantial chunk of world history. So does Fernand Braudel's three-volume *Civilization & Capitalism*. But no single writer can reliably explain everything. I put Mr. Wood's question to a historian friend, who said, "The key may be not to look for world histories but to pick historians writing on a subject they really know about. For the general reader some of the nineteenth-century people are very good—Prescott, Michelet, Macaulay, and the like. And a lot of them wrote prose that is beautiful to read."

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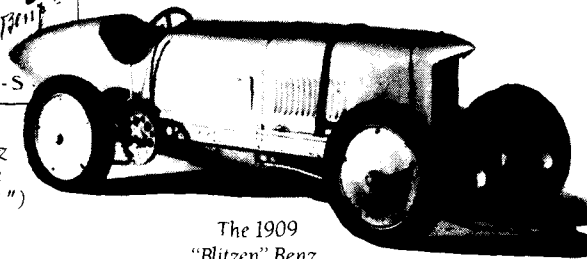
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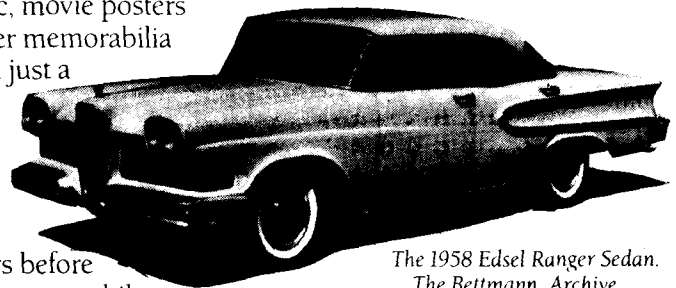


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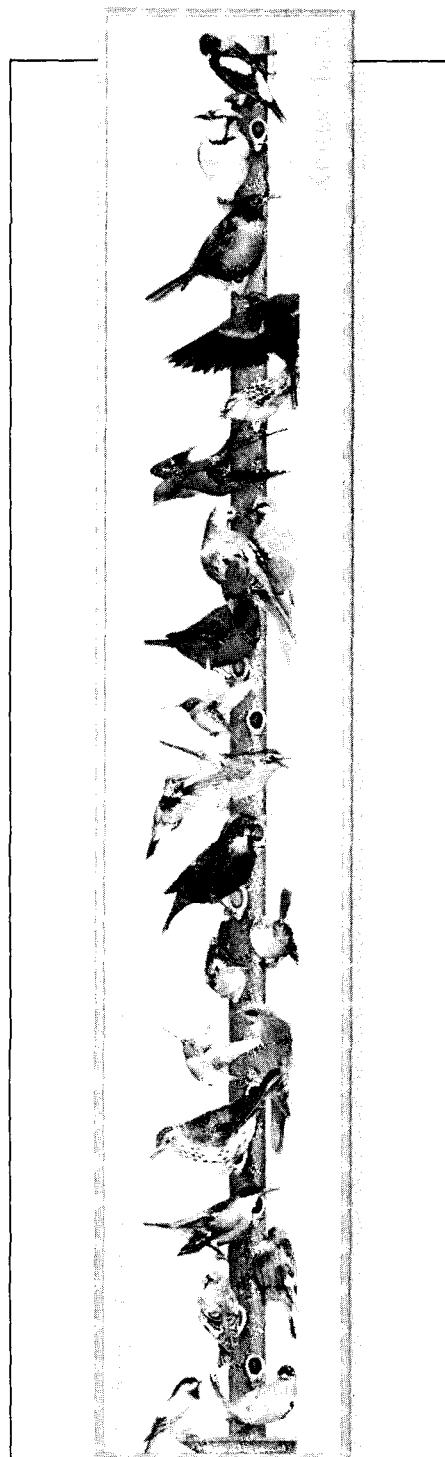


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ADVICE & CONSENT

As a friend and comrade of Irving Howe's, I'd like to comment on Sheldon Wolin's review of *Socialism in America* ("The Radical Tradition," November *Atlantic*).

Wolin presents Howe, a man who celebrates socialism as the movement that enabled "the masses of the lowly . . . to enter the stage of history," as a manipulator trying to stave off the discontent of the losers in order to defend the power elites. Moreover, Wolin associates Howe with the sins of the "contras of a neo-conservative, ex-Trotskyist persuasion," whereas Howe was perhaps the first intellectual on the left to define, and begin the fight against, neo-conservatism.

In his book Howe addresses the failure of socialism in America. He describes the Debsian movement, imbued with the democratic radical tradition, as "generous in its sentiments, quick to solidarity with the oppressed," and he says that it "must still seem—especially to those who have tasted the sour fruits of later ideologically 'correct' radicalism—an attractive enterprise." Howe argues that this movement, however, was also affected by Protestant evangelical moralism, which made dealing with a complex society very difficult.

For Wolin, this nuanced thesis is a rejection of the Debsian, and above all the democratic radical, tradition. Was Debs right to turn his back on the achievable struggle for socialism in the AFL and to cast his lot with the Wobblies, who fought for industrial unionism a generation before its time had come and in a way certain to lead to defeat? Howe thinks that Debs was wrong, for reasons having to do with the limitations of that moralistic culture. Wolin reads this as a reprehensible pragmatism.

Wolin thinks that socialism failed in this country because of "its inability to connect with the democratic tradition." But, as Howe shows (and Nick Salvatore has documented beyond question), Debsian socialism *did* connect with that anti-hierarchical and grass-roots spirit. That tradition, thank God, still exists, and a new American socialism must make common cause with it, hopefully with greater tactical intelligence this time around.

Irving Howe has paid dues all his life. His book is not the attempt of an ex-radical to come to terms with power. It is the work of an active participant in the

struggle, who understands that we will never change the realities of power in this country if we are pious and smug about our own myths.

MICHAEL HARRINGTON
New York, N.Y.

Although Jack Beatty is mostly on A track in his Note on MNLCI in your November issue, he perpetuates the myth that somehow the Soviets cheated on détente in their support for "wars of national liberation" and the spread of communism. Not at all. They explicitly told us all along that this was what they meant by "peaceful co-existence" and that for them this policy would share their vocabulary. They took it for granted that as realists we would compete with them in the pursuit of antithetical policies in the course of which we would both have undertaken to stop short of war with each other. That we should have become paranoid over their successes must surely have surprised them.

Sometimes we fail to recognize that the Soviets do indeed tell us precisely what they mean and mean what they say.

JOHN D. TOOGOOD
Nepean, Ont.

Richard Bausch's short story "What Feels Like the World" (October *Atlantic*) is one of the most heartwarming pieces I have ever read.

MICHELLE KU
Ithaca, N.Y.

For the record, I do not think that Dr. William Brydon, the only European to finish the march of the retreating British army from Kabul in 1842, would agree that he was, as John Keegan ("The Ordeal of Afghanistan," November *Atlantic*) says, "particularly well mounted." By his own account:

I was pulled off my horse and knocked down by a blow on the head from an Afghan knife which must have killed me had I not had a portion of a Blackwood's magazine in my forage cap. As it was, a piece of bone about the size of a wafer was cut from my skull and I was nearly stunned but managed to rise on my knees and seeing that a second blow was coming I met it with the edge of my sword and I suppose cut off some of my assailant's fingers, as the knife fell to the ground; he bolted one way and I the other.

VICTORIA SCHOFIELD
New York, N.Y.



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REPORTS & COMMENT

NOTES

UNDER THE WEATHER

DO YOU HAVE the impression, as I have, that the advent of the “feel-good” evening news program—now standard fare on local TV stations across the country—has coincided somehow with the emergence of a “feelbad” school of weather reporting?

It used to be, if memory serves, that weathermen looked for the silver lining in every cloud. When the weather was wet, they would say things like “Well, we needed the rain” or “Good weather for ducks, anyway.” When the weather was hot, they would say, “Come January, you’ll be wishing for a day like today.” When the weather was bitterly cold, they would say, “A nice night to curl up in front of the fire with that book you’ve been putting aside.” Weathermen were far from adept at forecasting, but at least they attempted to ease one into the elements.

Somewhere along the way, even as rain was turning into precipitation, TV

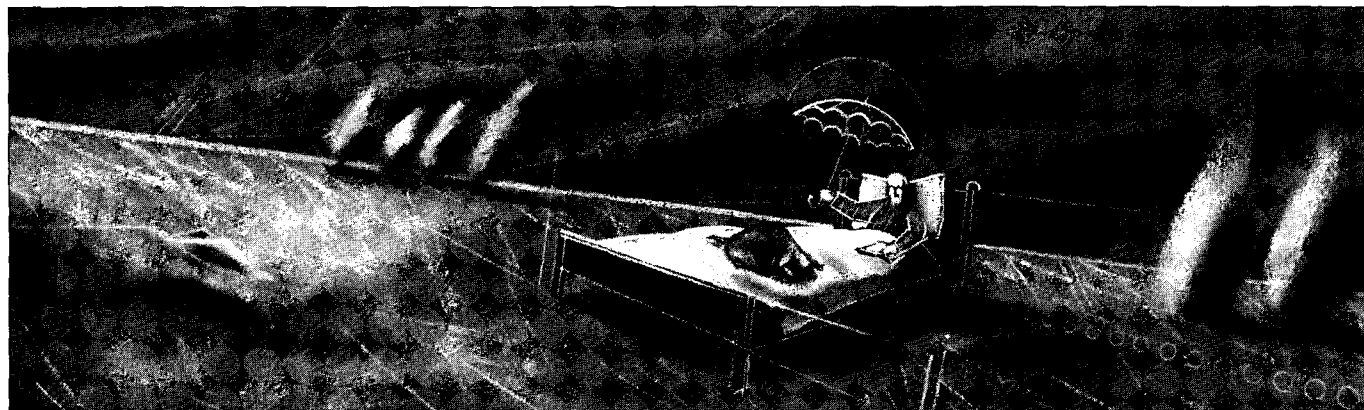
weathermen metamorphosed into meteorologists. They obtained graduate degrees and the imprimatur of the American Meteorological Society. At the same time, they acquired powerful new tools for the precise calibration of human misery. With these it became possible to contemplate the weather and pronounce that conditions once tolerated as merely bad were in fact worse than anyone had imagined.

The innocent beginning of this trend was an innovation conceived in 1939 by Paul Siple, an American geographer and explorer. Accompanying Admiral Richard E. Byrd on his Antarctic expeditions, Siple had become concerned with the combined effect of high winds and low temperatures on the human body. His efforts to gauge the aggregate “cooling power” of low temperature and moving air led to a doctoral dissertation and to the first formulation of the concept of windchill. Siple’s windchill factor has been employed by the military since the Second World War. It was widely adopted by civilian forecasters during the nationwide overhaul of local TV news broadcasts which occurred in the 1970s.

The basic windchill formula—of which several variants now exist—yields a numerical scale for the rate of heat loss

from the human surface. The scale can be translated into equivalencies of sensation, or “apparent temperatures.” Windchill tables reveal, for example, that an ambient air temperature of 25° Fahrenheit in conjunction with a twenty-five-mile-an-hour wind has the same effect on naked flesh that a temperature of –13° would have on a windless day. In places like Iowa and Minnesota the windchill factor can produce apparent temperatures of –60° or –80°. Even in moderate climes windchill frequently pushes the perception of cold below the zero mark. The thermometer may well say 35°, meteorologists warn, but exposed human tissue could still suffer cryogenic trauma.

The warm-weather analogue to windchill is variously called apparent heat, humature, the heat index, or the temperature-humidity index. The concept of apparent heat was introduced by Robert Steadman, a textile-research engineer now teaching at Texas Tech, in Lubbock. Steadman’s pioneering work “The Assessment of Sultriness” appeared in the *Journal of Applied Meteorology* in 1979; broadcasters quickly incorporated his temperature-humidity index into their weather reports. Apparent heat, Steadman wrote, “is the tempera-



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ture which a given combination of dry-bulb temperature and vapor pressure 'feels like' to the typical human." Various tables have been compiled, similar to those for windchill, correlating likely combinations of temperature and humidity with equivalent values of apparent heat. If the dry-bulb (actual) temperature is 95°, say, and the relative humidity is 50 percent, then the apparent heat is 105° and falls within what the National Weather Service calls the Category II range—"sunstroke, heat cramps, or heat exhaustion *likely*, and heatstroke *possible* with prolonged exposure and/or physical activity." Standing in the shade does not help. Apparent-heat tables assume that one is there to begin with—and wearing a short-sleeved shirt. Needless to say, meteorologists are fond of apparent heat.

They are fond, too, of the air-quality index and the pollen count. And in those parts of the country that possess what Washington terms water-sensitive economies, meteorologists are prone to cite the Palmer drought index, the crop-moisture index, and the monthly-moisture-anomaly index. Not long ago, as autumn segued into winter, I was introduced to the dispiriting notion of heating-degree-day units, or HDDUs. Heating-degree-day units represent the number of degrees by which the average temperature in a given day falls short of 65° F. It turns out that in Massachusetts, where I live, the average daily HDDU deficit during the coldest half of the year is about 30 degrees. (The cumulative deficit, from the end of summer to the beginning of spring, runs to more than 5,000 degrees, an amount that, if subtracted from the total number of degrees logged in July and August, would produce two solid months of subzero weather.) For those who elect to remain indoors during prolonged cold spells, some forecasters now provide a potential-indoor-relative-humidity index. This measure can be used to predict whether static electricity (fostered by central heating, which dries the air) is likely to be a minor annoyance or a pitiless scourge.

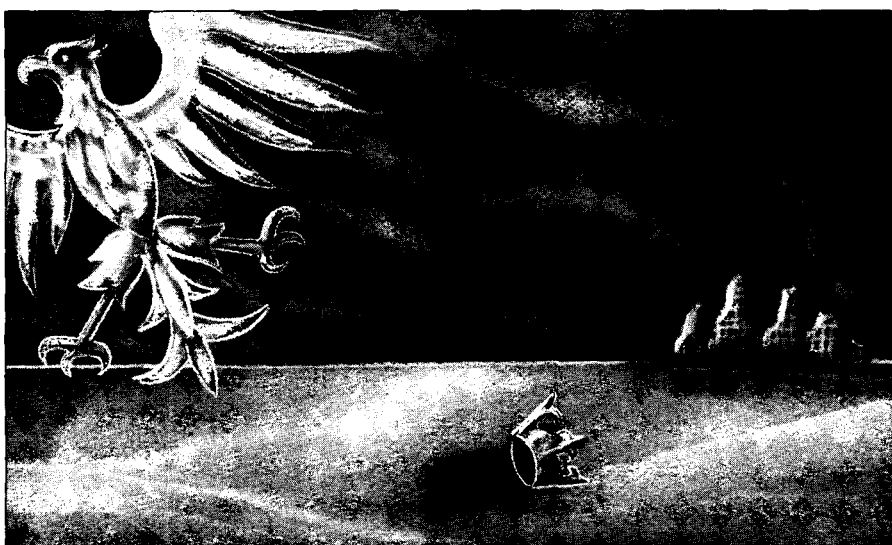
The newest family of forecasting indexes may transform meteorology into a sterner science still. Working on the assumption that atmospheric conditions have predictable and quantifiable effects on emotion, behavior, and physical well-being, a Minneapolis-based company called MultiData issues "bioweather" indexes for a hundred regions nation-

wide. Atlanta's twenty-four-hour Weather Channel, which has 1,700 cable affiliates and is received in 19 million homes, employs two of MultiData's diagnostic tools: the aches-and-pains index and the respiratory index. The Weather Channel has not yet subscribed to the moods index, the reflex index, or the thinking-proficiency index, but television stations in Cleveland, Wilkes-Barre, Baltimore, and Washington, D.C., now offer one or more of these. Before long it may be possible to learn from one's meteorologist that the morrow will bring not only snow and sleet but also a 50 percent chance of neuralgia, scattered neuroses, and a possibility of late-afternoon ne-

science, with a likelihood of electrostatic squalls from the radiators in outlying suburbs.

You don't have to be a weatherman to know which way the wind is blowing: new indexes, ever more refined, doubtless lie ahead. Few facets of human experience will remain untouched. Shall I part my hair behind? Do I dare to eat a peach? Weather forecasters may one day venture prescriptions on matters such as these. Perhaps by then the rest of us will have learned that the only advisory truly worth heeding is the forecast issued centuries ago by Jonathan Swift: "'Tis very warm weather when one's in bed."

—Cullen Murphy



LONDON THE GOVERNMENT OF MEMORY

It has a president, a premier, a parliament, opposition parties. All that Poland's government-in-exile lacks is a country

MY FIRST GLIMPSE of the President came as I was wandering through the *zamek* (which literally means "castle") in London's Eaton Place. This quiet and dignified street is lined with lovely white Palladian buildings, a number of which are used as embassies or consulates—and the *zamek* is virtually indistinguishable from the rest of them, except that its doorway, instead of boasting a golden plaque that proclaims the Embassy of X or the Consulate of Y, fea-

tures only an uninformative street number.

At one point in my visit there I must have strayed into the wrong room, because as I was walking down its impressive, ceremonial length, I was stopped in my tracks by the sight of a frail, extremely old man, seated behind an elegant antique desk. "Excuse me," I said in Polish. "I guess I shouldn't be here." There was no answer. "Excuse me," I repeated in English, but the figure behind the desk was either dozing, reflecting deeply, or simply refusing to acknowledge this alien intrusion. I was about to step away when several elderly gentlemen approached in highly respectful postures. "Mr. President," one of them said, "we have something here to bring to your attention."

It was several days before I had a fuller encounter with Mr. President. In the intervening time I met with the premier, the undersecretary of state in the Department of Foreign Affairs, and leaders of two of the four opposition par-

ties. These personages preside over a state of mind more than a physical location. All of them are members of an institution known as the Polish government-in-exile, surely one of the more obscure and idiosyncratic phenomena in the annals of modern politics. We all know about dethroned monarchs using up their fortunes while they wait for the moment of their return, about representatives of conquered nations dolefully demanding their countries' independence, and about provisional groups forming abroad in hopes of overthrowing a hated government. But the Polish government-in-exile constitutes an entire, though miniature, parliamentary system, which for forty-five years and in the teeth of all pragmatic reality has claimed to be Poland's sole legitimate government, and which for the past four decades has survived without exercising any practical power or giving a blink of official recognition to the Poland known to us from the news and the map. The government's parliament has met regularly every few weeks, its budget has been published annually (it was about \$100,000 last year), and the President's appearances at various émigré functions have been greeted by rising audiences.

Is this a Polish joke that has gone on too long? Clearly, there's material for farce here. For if the government-in-exile has largely ignored contemporary reality, reality has repaid in kind. Even old-time Polish émigrés outside of Britain will often say with surprise, "Oh, they're still around?" when reminded of their alternative government's existence. But there's another side to the story. The people who participate in this anomalous political constellation are for the most part intelligent, politically moderate, and without any delusions of grandeur. It's just that they are possessed of an unusually stubborn fidelity to their historical experience and a refusal to compromise their sense of principle to the mere drift of events. Such virtues are not much valued in our fickle times, but they represent a strand of Polish character and tradition that cannot be attributed to mere émigré eccentricity or to that vague entity known as the Polish romantic spirit.

THE EXILED GOVERNMENT WAS formed not out of any romantic impulse but in response to the all-too-solid realities of the Second World War. After Poland was invaded by Germany from

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the west and Russia from the east in September of 1939, the Polish government—itsself a rather short-lived entity, formed during the brief interwar period of Polish independence—fled the country to Romania, where, under German directives, its members were immediately placed under house arrest. In order to assure the continuation of a functioning ruling body, the interned president appointed in his place Wladyslaw Raczewicz, who was already in the West, and a new government was put together in France by the various diplomats, generals, and other personages who found themselves in the Allied countries. It is from this constitutional act that the government-in-exile derives its claim to legitimacy as the democratically chosen representative of a free and independent Poland.

After the fall of France the newly formed government moved to England, where in the initial stages of the war it functioned with not only the recognition but also the full support of the Allies. But as the war went on, Poland became from the point of view of the Allies more and more of a side issue and an annoyance in their dealings with the Russians; from the point of view of the Poles their country was, metaphorically and indeed almost literally, sold down the river.

At stake were two essential matters: the desire of the Russians to annex large parts of the Ukraine and Lithuania which had belonged to Poland before the war, and their creation of a puppet Lublin Committee, which eventually became the nub of the postwar Polish government. Initially the exiled government kept up strained relations with Stalin—but these broke down after the discovery of the Katyn Forest massacre by the Russians of up to 15,000 Polish officers and intellectuals. After a round of accusations and counteraccusations between the Poles and the Soviets, Poland was left out of the negotiations concerning its future: no Polish delegates were invited to the Tehran conference in 1943, where the reorganization of Polish borders was basically accepted, or to Yalta. The British, acting under increasing pressure to maintain a united front with the Russians, kept yielding on the Polish question, until all the Russian demands at Yalta—for altered Polish borders and the installation of a pro-Russian government—were conceded. To add insult to injury, the British, at Stalin's overture, persuaded the exiled Poles to

name several important people, including some underground leaders within Poland, who were supposedly to be included in the new government; of the sixteen delegates nominated to talk with the Russians, thirteen were sentenced to varying periods of imprisonment, and of these, three were never heard of again.

Among the exiled Poles these events generated a sense of injustice, even betrayal. After all, the war had started over Poland, and some of the most savage fighting and decimation took place on its territory; the Polish underground resistance was probably the fiercest in Europe, and Polish forces organized in the West under General Sikorski and General Anders were at least 300,000 strong and performed with widely acknowledged courage. But despite these losses and sacrifices history was inexorably moving in the direction of a new Poland—a nation that in the eyes of the wartime expatriates was a hokum creation, without any popular or constitutional validity. By 1945 international recognition had been transferred to Warsaw. The government in London was now left without a country to govern but with a powerful resolve that its version of historical truth and the vision of Poland for which it had fought should not be forgotten.

COUNT EDWARD RACZYNSKI, the fourth president of the government-in-exile, is ninety-four years old and nearly blind. He lives with his amanuensis, Aniela Mieczyslawska, in an unostentatious though well-appointed Belgravia apartment that features a striking collection of Polish paintings, and he spends his days reading, writing, and fulfilling his few official functions. His diplomatic career goes all the way back to the League of Nations, where as a young man he was a member of the Polish delegation. He subsequently became the Polish ambassador to Britain. During the war he had the double post of ambassador and minister of state in charge of foreign affairs, and because he knew people like Winston Churchill and Anthony Eden quite well, he was a pivotal figure in conducting negotiations on behalf of the Polish cause.

In effect he has lived his entire long life by the dimming light of that cause; he has been a member of the government-in-exile since the war, has lobbied in various émigré organizations, and has written several books on Polish subjects,

notably *In Allied London*, his memoir of the government's wartime years. Yet his thinking does not show any of the imbalance that sometimes comes from single-mindedness. In his writings and in conversation he displays a firm sense of proportion and an ability to fit Polish problems into the larger geopolitical picture. Like a stoical bow to the ways of destiny, the phrases "That's how it happened" and "That's not how it happened" recur regularly in his accounts of historical events. "We hoped that the outcome of the war would be similar to the First World War, that both Germany and Russia would be defeated," he admits with a gentle self-irony. "But that's not how it happened."

When Ms. Mieczyslawska (who refers to Mr. Raczynski invariably as Mr. President but certainly doesn't hesitate to speak her mind in his presence) becomes impassioned with outrage at the memory of Churchill's unwillingness to hold out for a better deal at Yalta, Mr. Raczynski interjects with a more measured view: "Churchill was the most decent of the three. It was just that he was pressed hard by the Americans and the Muscovites. He thought that if Poland would make concessions, they could guarantee it some independent status. We may have had our illusions, but the British had even more. He was never badly disposed toward Poland—it was just that for him it was 'Right or wrong, my country comes first.'"

Practiced diplomat that he is, Mr. Raczynski is perfectly aware of the limitations, and even the slight absurdity, of his position. Certainly, the government-in-exile cannot give him much sense of personal power. Nor is he filled with messianic hopes for the future. He's not holding his breath waiting for the moment of liberation. (Who knows, though? "There's no prophet who can say what will happen. After all, czarism was fought down through two wars, over more than a century," he says.) But he has no illusions that if it ever came, the London group would ride in on white horses to take over the reins of power; it would merely pass on the symbols of its legitimacy, which it inherited from the pre-war government.

Mr. Raczynski does have a calm and absolutely unwavering conviction that legitimacy lies on his side and that giving this constitutional principle some form is crucial to honoring the past and to maintaining a sense of national continuity. That belief has sustained him

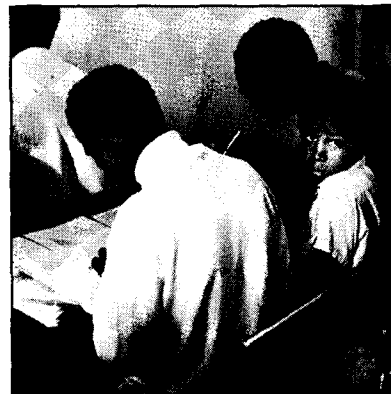
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and many of his colleagues in their seemingly quixotic enterprise. The London "*parliamencik*," as he sometimes refers to it, using the Polish diminutive, is a faint leitmotif, almost lost among the crude drumbeats of history, which says that "what happened" is only something that happened, not what should have happened; that the Poland of Muscovites and Varsovians is a mere historical accident, rather than an expression of popular will or historical justice. From where President Raczynski sits, the charade is taking place on the Vistula rather than on the Thames.

"Our direction of thought is the following," he courteously explains. "At this moment nobody can liberate Poland. What can we do for the future? We can give some money for stipends to young people, for scholarship and cul-

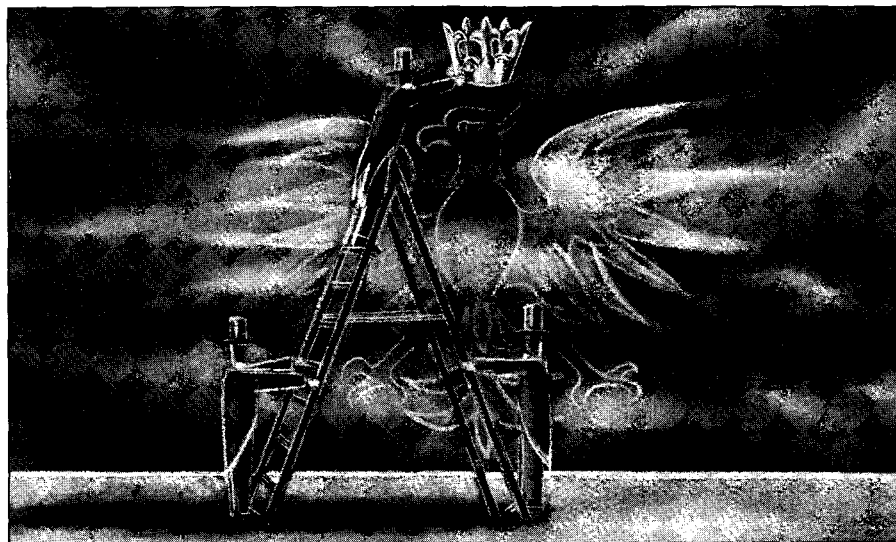
its members remind the British public of the injustice perpetrated at Yalta. The government also helps new Polish emigrants and, especially in recent years, sends aid to dissident groups within Poland. It dispenses medals and other distinctions to Second World War soldiers and receives visitors, ranging from ordinary people to such eminences as Poland's Cardinal Glemp, who paid a highly visible call on President Raczynski (relations between the London government and the Catholic Church have always been close).

There have been some radical suggestions for changing all this, among them one advanced by Rowmund Pilsudski, an elderly gentleman who lives in London surrounded by rare books and who heads the Polish Freedom Movement, Independence and Democracy, a party with

the common enemy, Solidarity is an unlikely ally for the upper-class grandees in London, and relations between the groups have been complicated. Explaining his group's policy toward Solidarity with evident stiffness in his voice, Premier Kazimierz Sabbat says, "We're supporting them as much as we can, but we do not expect from them anything in return. In particular, we do not expect any acts of recognition. It wouldn't serve any purpose for them—they would be prosecuted." Apparently, behind this position lies a history of disappointed expectations. Though no one will talk about this openly, it seems that the London group wanted to form stronger ties with Solidarity but was rebuffed. Nevertheless, there are points of contact between them, and the growth of the Solidarity movement has created considerable excitement in London. The government has given indirect aid to organizations associated with Solidarity and has met with some reciprocal interest. President Raczynski has had discussions and correspondence with Solidarity organizations abroad. Some of the post-Solidarity emigrants take a keen interest in certain aspects of the government-in-exile and the thread of history it represents. It is reliably rumored that the presidency, which is passed on by appointment, was offered to a highly placed Solidarity activist, who refused the post but only after giving it serious thought.

One figure who is visited by quite a few "new people" these days is Dr. Lidia Ciolkoszowa, who after the death of her husband, Adam Ciolkosz, became until recently the head of the Polish Socialist Party outside of Poland. She lives in a rather threadbare apartment in the Putney section of London; if you glimpsed her on the street, you might see only a slightly bent over, unprepossessing elderly woman. But this impression would be dispelled the moment she began to talk. Dr. Ciolkoszowa is a trained historian and, with her husband, the author of innumerable articles, several books, and sundry lectures, many of them delivered on Radio Free Europe. But even given her profession, the vividness of her historical recall is astonishing. She can remember the splits and alliances within the left in 1918, the Socialist Party's conflicts with the government over the Speaker of the House in 1928, and the names of people imprisoned in the early thirties.

Perhaps more than most of the other people connected with the government-



ture. But we can also try to assure that the nation preserves its identity and its memory. There's nothing else to be figured out."

IF POWER CORRUPTS, perhaps the lack of it can purify. Politics practiced by these platonic means is a mild business, characterized more by harmony than by dissension. For some members of the government, participation in it undoubtedly has snob appeal or fulfills a need for social prestige—especially in England, where most places at the top are quite inaccessible to Polish émigrés, even those with fairly good pedigrees. On a more concrete level the government drafts memoranda on Polish matters, such as violations of human rights within Poland, and presents them at various international meetings—for example, the Helsinki conference. From time to time

federalist leanings. Pilsudski has proposed that the government be essentially abolished ("Such games don't interest us") except for the presidency, whose symbolic significance he, like almost everyone else among the older émigrés I've talked to, considers indispensable. But even such dissenting opinions do not provoke much heat anymore. Whatever old rancors may once have divided the now aging warriors have been washed away by time. "After all, we're civilized people," Mr. Pilsudski says, smiling.

Still, history works in ironic ways, and in recent years the becalmed waters of this civilized enclave have been stirred by currents that have brought a new infusion of vitality. This has happened with the emergence of Solidarity, which even after its suppression continues to question the legitimacy of official Poland as much as the Londoners do. Despite

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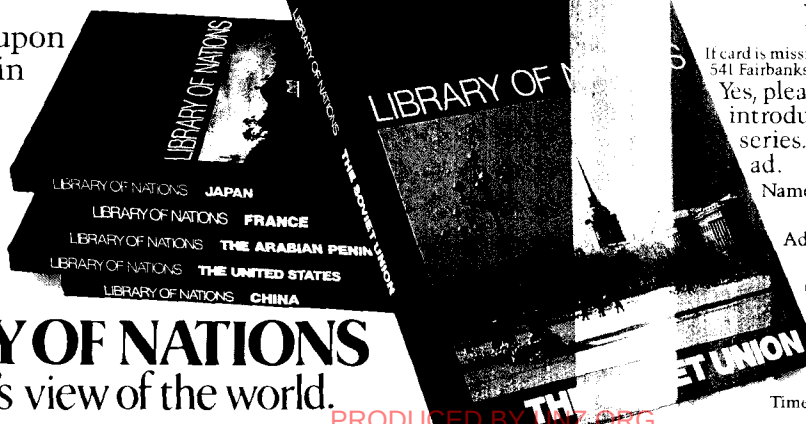
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in-exile, the Ciolkoszes during their arduous émigré years maintained an active involvement in the world of contemporary politics, through international Socialist organizations. But although you might expect a Socialist to show more skepticism, Dr. Ciolkoszowa stands by her fellow émigrés in supporting the government-in-exile (which she calls a "legalism," rather than the more frequently used "symbol") and shares their esteem for President Raczynski.

To many of Dr. Ciolkoszowa's younger visitors, her work answers a hunger for an indigenous political ancestry (she represents the liberal, democratic wing of the Socialist Party, whose ideals are shared by many of Solidarity's activists). And, because the piece of history she embodies has been largely suppressed in Poland, Dr. Ciolkoszowa has become an invaluable repository of information. The Ciolkoszes' essays and lectures are reprinted in the underground press; she receives admiring letters from dissident journals, and she carries on lively exchanges with the new generation of activists. In the Ciolkoszes' writings, as well as in the many émigré journals, memoirs, and institutes housing treasuries of documents, the meaning of preserving national memory becomes tangible.

IF YOU DO NOT take the government-in-exile's survival as a matter of mere amusement, the serious question it poses is how much value there is in symbolic value. Judging by Polish history, the answer seems to be a good deal. If there's anything uniquely Polish about this oddly stubborn, oddly poignant institution, it is a tenacious faith in the importance of remembering and in the power of political forms, gestures, and ideals. Such faith has been a practical necessity, a matter of survival, through much of Poland's history. For most of the past two centuries Poland has existed more as an idea than as a political reality—and the idea has been sustained largely through the loyalty of its successive emigrations and their ability to express their country's genuine, uncensored hopes and aspirations. The continuity of Polish culture owes much to the thought, writing, and other activities of the nation's expatriates, and the government-in-exile has a rich tradition within which to place itself.

Whether the memory of the past can remain alive beyond the generation that lived it is another matter. The government-in-exile was created within the

context of its peer emigration, and for that emigration it has served as a voice, a conscience, and a unifying force. The English slice of the wartime and postwar diaspora, now numbering about 180,000 people, was drawn from the ranks of the armed forces that had fought in the West, but it also included members of the intelligentsia and of an aristocratic and haute bourgeois elite. Over the years they have managed to create an impressive network of Polish organizations—schools, churches, an active scouting movement, clubs, libraries, museums, and historical institutes. In many cases their children have received both an English and a Polish education.

In a way, they have constructed, in microcosm, a replica of the Poland they knew. It is first and foremost anti-Soviet, but it's also a country of class distinctions, elaborate manners, and a tightly knit communal life (with all of their less attractive side effects)—a social order that existed before the advent of mass society as well as before the Russian occupation. It would not have remained the same even if history had moved in a different direction. By now the real object of these émigrés' affection probably exists only in the small world they themselves have created.

The younger generation has inherited this world, and with it some sense of Polishness, from its parents. But many of its members have visited the other Poland and have become actively involved in causes connected with Solidarity. And, naturally, they've also been assimilated much more thoroughly into British life. Many of them accuse their elders of being out of touch and tend to view the government-in-exile as a venerable anachronism.

Technically, the continuation of the government has been assured at least for a while. President Raczynski has appointed Premier Sabbat as his successor (although he reserves the right to change his mind), and there are people ready to take over some of the other posts. What happens after that is anybody's guess. But even if the Polish government-in-exile fades quietly into oblivion, after several decades of uninterrupted and orderly functioning, it can count itself a success, if not a minor miracle. But then, postwar Polish history has been marked by seemingly impossible events—and perhaps, in its very unlikelihood, the marginal London organization belongs to that history after all.

—Eva Hoffman

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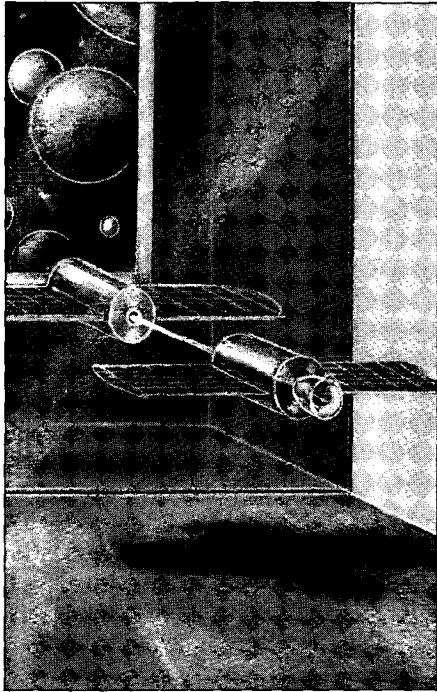
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WASHINGTON

THE AUTHORIZED VERSION

*The Reagan Administration has been
misrepresenting its own internal
reports on the feasibility of the
Strategic Defense Initiative*

ALBERT CARNESALE, a Harvard professor and a longtime adviser to the Arms Control and Disarmament Agency, likes to say that at some point every President goes into a national-security meeting or sees a wall chart on possible nuclear casualties and says, "Wait a minute. I'm responsible for the lives of two hundred million Americans. You're saying that if the Soviet leader wants to kill them all, he can?" An adviser replies that yes, sir, he can. "Well, that's no good," the President says. "Change that."

For Ronald Reagan this epiphany occurred shortly before he reached the presidency. During a 1979 visit to the North American Air Defense Command headquarters, inside Cheyenne Mountain, near Colorado Springs, Colorado, Reagan asked the commander on duty what could be done if the screens showed a Soviet ICBM approaching the United States. Not a thing, the commander said.

Martin Anderson, the domestic-policy adviser for Reagan until 1982, who was present on the NORAD trip, said in an interview not long ago, "On the plane back Reagan was struck by the fact that in the event a missile was fired at the United States—even one missile—there is absolutely nothing we could do." A few months later Anderson wrote a campaign memo outlining ways to capitalize on Reagan's concern while dispelling his public image as a warmonger. Anderson proposed the development of a protective missile system. "That idea is probably fundamentally more appealing to the American people than the questionable satisfaction of knowing that those who initiated an attack against us were also blown away," Anderson wrote in the memo. "Formulated properly, the policy should become known in the press as 'Reagan's Peace Plan' or some such nomenclature." Anderson's plan was one of several sources for what has since become known as the Strategic Defense Initiative.

According to government sources who must remain anonymous, on Saturday, March 19, 1983, George A. Keyworth II was summoned to Reagan's office to hear Reagan's thoughts about a speech that would set in motion Anderson's idea: replacing the current nuclear strategy of deterrence—that is, one based on mutually assured destruction—with a strategy of defense against nuclear weapons. Until he left the government for private industry, in December, Keyworth was the White House science adviser, the person whose job it is to counsel the President on scientific and technical issues. Reagan was scheduled to give the speech, which would come to be known as the Star Wars speech, in five days. He wanted Keyworth's scientific advice.

Coincidentally, the military-technology panel of the White House Science Council, a group that reports to Keyworth, had spent the past year working on an evaluation of both offensive and defensive technologies. The panel members had listened to a wide range of experts on all the technologies that strategic-defense advocates were pushing: the chemical space-based laser, the ground-based laser, "smart rock" kinetic kill vehicles that work like space bumper cars, the hydrogen-bomb-pumped x-ray laser, and the particle beam. Contrary to Keyworth's characterizations of its findings, sources closely connected with the report (still classified) say that it concluded that no technology had the

potential to alter the current nuclear balance of terror. It answered the big question with NO in capital letters, though it did recommend further research on every possible technology. According to Solomon J. Buchsbaum, a vice-president at the Bell Laboratories research division of AT&T and the chairman of the White House Science Council, this report was signed and sent to Keyworth in early 1983. Keyworth, panel members say, did not object to any of the panel's conclusions.

But, then, Keyworth was no stranger to skepticism about space weapons. He had repeatedly stated his view that strategic defense wouldn't work. According to Angelo Codavilla, a supporter of switching to a defensive strategy, who was then an aide to Senator Malcolm Wallop, of Wyoming, Keyworth tried to talk the Senator out of his belief in space weapons. Codavilla, who was present at the meeting, which took place in October of 1981, says that Keyworth compared research on strategic defense to research on nuclear fusion, which, he said, had wasted a great deal of money and failed to produce results, dampening public willingness to fund more-promising science.

ON THAT SATURDAY in March of 1983 the President showed Keyworth a draft of his speech; it clearly indicated a dramatic personal commitment to strategic defense. According to Keyworth, Reagan was calling for defenses "all the way from the battlefield to the strategic-force structure"—for using American ingenuity to develop defenses even against tanks. Keyworth told me that his reaction was, "Mr. President, if there has ever been a feasible time to attempt to develop boost-phase defenses, the real lever, now is the time." "Boost-phase" defense—the capability of destroying enemy missiles just after they have left their silos—is the cornerstone of strategic defense.

Keyworth told me that his change of mind was occasioned by a breakthrough in astronomy that suddenly made the ground-based laser look feasible. Ground-based lasers work by shooting up through the atmosphere to orbiting mirrors that aim their beams at incoming missiles. Until recently, the distorting effects of the atmosphere were thought to make such weapons infeasible. According to Keyworth, the White House Science Council had reported that some astronomers in Hawaii were in the pro-



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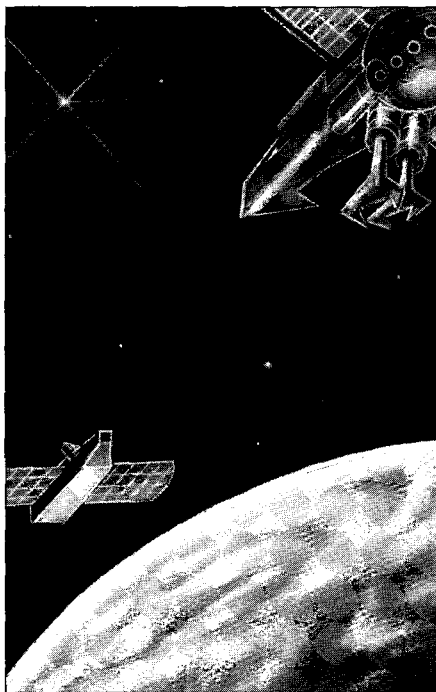
cess of developing a mirror that could be deformed to compensate for these distorting effects. This technology gave hope of eliminating the inherent defect of the ground-based laser. A source who has read the council report, however, told me that this breakthrough received only a minor note; it was not treated as important.

"The fact is, I learned more from the President than he learned from me in preparing that speech," Keyworth said of the meeting. He emerged one of the Administration's most vigorous spokesmen for strategic defense, and he later told me, "When the speech was given, I was the happiest man in the world."

Sources say that what Keyworth learned from Reagan was that strategic defense was going ahead no matter what: he could be either on the team or off it. He is not the only Administration official to have learned that lesson. Since March of 1983 several White House and Pentagon studies that have expressed reservations about strategic defense have been characterized by the Administration in ways that cast a distortedly favorable light on the SDI.

FOLLOWING THE Star Wars speech the Administration convened several study panels to guide the SDI program. Two have been highly publicized: the sixty-seven-person Defensive Technologies Study Team, also called the Fletcher Commission, after its director, James Fletcher, a former NASA administrator; and a panel led by the defense consultant Fred Hoffman. The Fletcher Commission produced seven volumes, covering every aspect of space-defense technology. Hoffman's group concentrated on the strategic implications of the SDI.

The Fletcher and Hoffman reports are both classified, but they are repeatedly cited by Administration officials and have been offered as Exhibit A in the Administration's case for the SDI. Secretary of Defense Caspar Weinberger told the National Press Club in May, 1984, "We have some of America's finest scientists who were members of the Fletcher Commission. . . . they found the dream to be indeed possible, after a study of about a year. And I'm here today also to tell you that some of our most renowned national-security experts, who are members of the Hoffman commission, declared that an effective strategic defense offers very great promise of strengthening deterrence and improv-



ing strategic stability." Keyworth, in a 1984 speech at the Brookings Institution, said that the Fletcher Commission had determined that "the President's objective is not an unrealistic goal and they concluded it probably could be attained."

Portions of the Fletcher report have also been cited as evidence that some of the SDI's intractable problems can be overcome. In a statement, Lieutenant General James A. Abrahamson, Jr., the head of the new SDI Organization, wrote that "the Fletcher panel has identified ways to counter every countermeasure the offense may choose to make. . . . the Fletcher study concluded that effective discrimination of decoys from warheads could be accomplished in mid-course"—this meaning that the Soviets would not be able to trick a space defense by launching cheap dummy warheads alongside the real warheads.

But is that what the study really says?

After Abrahamson had written his statement, the retired Air Force Major General John Toomay, who is a deputy chairman of the Fletcher Commission, contested the document. Toomay, though an SDI supporter, said that the commission did agree on what offsetting measures were probably possible, but that research was needed to determine if they were practical.

Even the Toomay version may be gilded. Countermeasures are the subject of the (classified) seventh volume of the commission's report. According to Theodore Postol, a former assistant to

Admiral James D. Watkins, the chief of naval operations and a strong supporter of the SDI, "If you read volume seven first, you wouldn't bother reading the rest of the report. It presents an overwhelming case against the possibility of a hope of mounting something useful. It quite unambiguously indicates the problem was insolvable unless certain things were solved that no one even knew how to address."

More important, Administration claims that the report endorses Reagan's overall plan are disputed. There are classified and unclassified summaries of the Fletcher report, and both present a generally positive picture of strategic defense. The classified summary contains a statement that the panel "takes an optimistic view of newly emerging technologies and with this viewpoint concluded that a robust, multitiered ballistic missile defense system can eventually be made to work." The unclassified summary of the Fletcher report says,

The members of the Defensive Technologies Study Team finished their work with a sense of optimism. The technological challenges of a strategic defense initiative are great but not insurmountable. . . . The scientific community may indeed give the United States "the means of rendering" the ballistic missile threat "impotent" and "obsolete."

But Kenneth Cooper, the retired lieutenant general who headed the Fletcher Commission's systems-integration panel and who with Toomay wrote the classified summary, told me recently that the unclassified summary does not reflect the views of panel members—it is too optimistic. After several drafts, Cooper said, he and Toomay were able to hammer out a consensus that reflected the views of the panel's nine chairmen. "The original draft was very stark," Toomay says. "It listed problems like stability during the deployment phase and concern that discrimination of decoys might not be made to work." Toomay says that they prepared drafts for Fletcher, who was difficult to satisfy. "The way the issues were brought out was considered—well, I hate to use the words—too forthright. They wanted the document to read more smoothly. You don't have to call a spade a spade. You could call it an instrument for digging in the dirt."

After the draft had been smoothed, it was submitted to Fred Iklé, the assistant secretary of defense, and to Richard De-

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Lauer, the undersecretary of defense for research and engineering, and it underwent further transformations, this time without Fletcher Commission officials being consulted. According to Toomay, "The Administration in its public documents chose to interpret what the commission found out in a way that pleased them. A lot of technical people on the panel emphasized problems like whether the battle-management algorithms [part of the computer programs] could be done. The Administration tended not to emphasize these problems."

A dispute also surrounds the Hoffman Commission report. Weinberger, in speeches, has cited it as approving the SDI. But the twelve-page published summary of the Hoffman study devotes little attention to the plan that Reagan announced. Only a few sentences of the summary discuss population defense—rendering attacking missiles "impotent," to use the word from the President's March, 1983, speech—and those few sentences betray no enthusiasm. The report mentions "the possibility that nearly leakproof defenses may take a very long time, or may prove to be unattainable in a practical sense against a Soviet effort to counter the defense."

The Hoffman summary also mentions "the risks inherent in a program where each of a large number of demanding technological goals must be met in order to realize any useful result at all." Fred Hoffman later told *Science* magazine, "If what you want defenses to do is to protect the bulk of our population against an attack by a large Soviet force that has the objective of destroying our population, then you would need everything to work. Even as a nontechnician, it seems to me that the likelihood of this happening is small." What the Hoffman report in fact endorsed was not the SDI but a limited system of traditional ABM missiles deployed in the United States and Europe, to decrease Soviet confidence that a first strike would succeed in destroying our missile silos and to offer some hope of limiting the casualties in a war.

When Administration officials speak of their SDI studies, significantly absent is any reference to a third panel, headed by Franklin C. Miller. Miller, the director of the Pentagon's Office of Strategic Forces Policy, was assigned to investigate strategic questions similar to those that occupied the Hoffman panel. Miller's commission was composed of mid-level officials from the Defense Depart-

ment, the National Security Council, the State Department, and other security agencies.

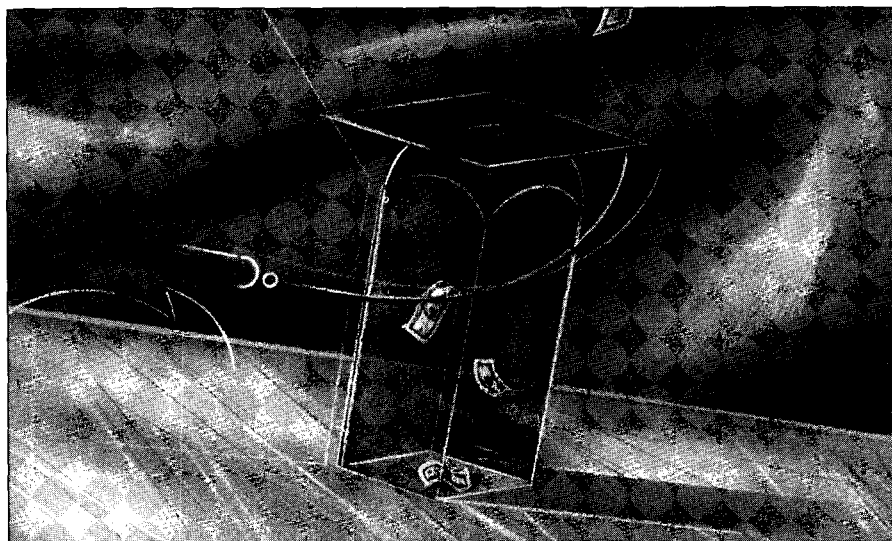
No unclassified summary of the Miller report was ever released. "The study didn't meet with their approval, so it was suppressed," a government official familiar with the Miller report says. A defense consultant who has read the report says, "The report doesn't boldly state that the plan is idiotic. But after reading the list of disadvantages, only a fool could come to the wrong conclusion. It doesn't pull punches."

Miller declines to comment on his panel's findings. My calls to the Pentagon about the Miller report were referred to a spokesman who would not even re-

lease the names of panel participants.

The handling of these reports is hardly sinister, but it does raise a disturbing question. Is the Reagan Administration facing up to the real scientific and strategic difficulties presented by the SDI, or is bureaucratic pressure to be on the team muffling internal criticism and making candor look like a species of disloyalty? If the SDI is really the President's way of saying "Change that" to the grim facts of mutually assured destruction, then both accurate scientific appraisal and well-founded public trust are needed to turn the President's dream into reality. Hyping the SDI could open a credibility gap perilous to that trust.

—Tina Rosenberg



WASHINGTON

STUDENT-AID MUDDLE

College students need help, but so do the federal programs that provide it

THE U.S. SECRETARY of Education, William J. Bennett, infuriated educators last winter when he suggested that many college students could cope with proposed cutbacks in federal financial assistance if only they would give up their cars, their stereos, and their vacations at the beach. Shortly thereafter he infuriated educators again when he stated (incorrectly) that 13,000 students whose families had incomes of \$100,000 or more were getting federally subsidized college aid. Both comments were offered in defense of a Reagan Administration plan to reduce the number of stu-

dent-aid awards by two million—almost a quarter of the total.

The Reagan proposals were poorly conceived, clumsily drafted, and short-sighted in the extreme; they went nowhere on Capitol Hill. Nonetheless, beyond the inadequate plan and the inflammatory rhetoric in support of it lay legitimate criticisms of the federal financial-aid system. The college administrators, government bureaucrats, and education lobbyists who took Bennett to task in public will concede in private that there are plenty of problems to be solved.

Members of the education lobby believe that federal aid not only is essential to many college students but also is a mainstay of the country's economic growth and social progress. At the same time, they know that the student-aid system is being abused—as evidenced, for example, by the high default costs of student loans. They know that the system, which comprises a half-dozen ma-

for programs and a handful of smaller ones, is far too complex for many students and their parents to understand. And they know that Washington's key objective over the past two decades—helping the financially needy to obtain the benefits of post-secondary education—is being compromised as the government seeks to aid students from middle-class families. Among educators all of this is an open secret. But the price of doing anything about it is one that no one seems willing to pay.

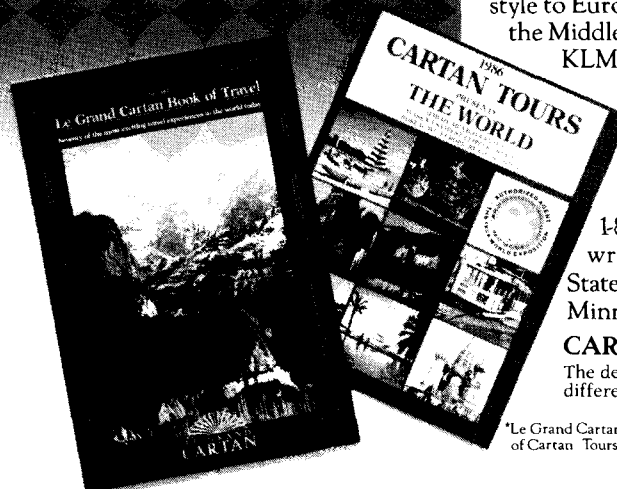
It is not hard to understand why: millions of people have a stake in the status quo. Student aid is popular, benefiting Americans across class and party lines. Last year Washington spent roughly \$9 billion on student financial aid of one kind or another. This money helped five and a half million students at roughly 3,600 two- and four-year colleges and universities and 4,400 proprietary (for-profit) vocational schools. Student-loan funds were channeled through, and made a lot of money for, more than 13,000 banks and other lenders. At the federal, state, and local levels Washington's student-financial-aid programs have engendered and sustained a vast array of auxiliary institutions and agencies—large and small, public and private. Representatives from scores of organizations—students' groups and bankers' groups, great research universities and schools of motel management—routinely testify whenever Congress addresses the matter of student aid. Their message is almost always the same: Leave the system alone.

Yet change is in the wind. It may come either indirectly, through budget-cutting to help reduce the federal deficit, or directly, in ways that would both contain costs and address the current system's serious problems. Some modest budget-cutting has already occurred, and further cuts are likely. By next October, however, Congress must reauthorize the Higher Education Act—the omnibus law that governs most of Washington's financial-aid commitments. The reauthorization process represents the best chance in this decade for prudent reform. Whether Congress will ratify existing programs with only modest changes or come up with a major reshaping remains to be seen.

IN MANY ways the federal student-aid effort typifies what happens whenever a noble national objective is tackled piecemeal, by a variety of Administra-

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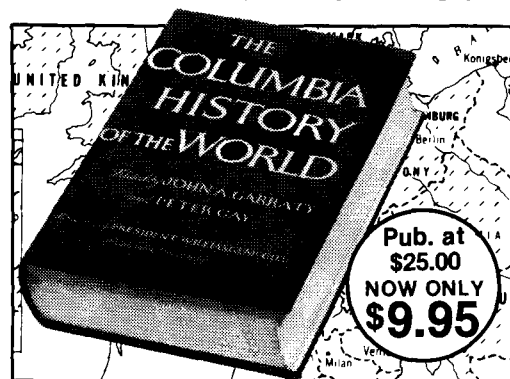
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tions, over a period of many decades. The United States resolved rather early in its life that higher education was a desirable commodity. The Morrill Act of 1862 gave each state public land to support and maintain a college where the educational emphasis would be on "agriculture and the mechanic arts." Washington did little else to advance higher education during the eight decades after Lincoln. Then came the Second World War. Even before that conflict ended, Congress passed the Servicemen's Readjustment Act, better known as the GI Bill. The law's education benefits found a lot of takers: one million in 1947 alone. The GI Bill also established an important precedent. Washington did not convey funds to institutions as institutions; it channeled money to institutions through grants-in-aid to individual students. The GI Bill made higher education available to millions of students. It also laid the foundation for a quick recovery from postwar recession and a period of sustained prosperity through the 1950s and 1960s.

When the Soviets beat us into space in 1957, with Sputnik, Congress responded by passing the National Defense Education Act. Among other things, the NDEA provided loans to academically promising but financially strapped collegians whose destiny might, in some as yet undetermined way, be linked to that of the nation as a whole.

All of this coincided with the emergence in academe of the idea of "human capital": the notion that the more skilled the work force, the more productive it tends to be. In 1960 Theodore Schultz, in his inaugural address as the president of the American Economics Association, wondered whether the human capital available was adequate to the nation's needs: underinvestment in knowledge and skills, he observed, "would appear to be the rule and not the exception." Schultz, the economist who was most responsible for the academic acceptance of the human-capital idea, later received a Nobel Prize for his work. Another future Nobel laureate, Milton Friedman, noted that capital-market imperfections made it impossible for many Americans to invest in their own economic potential. Doctors in training could get loans to finance their education from private sources (as they still can), because their future income was likely to be substantial. But working-class youngsters—or, worse still, disadvantaged minority youngsters—were such bad risks that no

private loans were readily available.

An appreciation of human capital underlay Lyndon Johnson's Great Society legislation. Federal aid for college students grew sharply, particularly for those from low-income families. The Higher Education Act of 1965 authorized the Guaranteed Student Loan (GSL) program, the Educational Opportunity Grant program, and the College Work-Study program. In 1985 these programs cost a total of \$4.8 billion, and nearly five million awards were made.

Under the Guaranteed Student Loan program, the largest financial-aid program, the federal government subsidizes local banks and other lenders to make low-interest loans to students. (The current maximum amount for undergraduates is \$2,500 a year.) Washington pays banks a special allowance—an interest subsidy of three and a half percent above the ninety-one-day Treasury Bill rate. Thus, if T-Bills are at 10 percent, the banks get paid 13.5 percent; students are charged eight percent, with the government paying the difference. In 1985 this program cost the government about \$3.7 billion and generated almost \$8 billion in loans. The loans are guaranteed by state agencies and ultimately by the federal government. If a borrower defaults, the state agency pays the bank for the lost amount and the U.S. Treasury Department reimburses the state agency. For banks, then, lending money to students under the terms of the GSL program is a lucrative, risk-free proposition.

During the 1970s Congress added several more student-aid programs. The most important of them was the Basic Educational Opportunity Grant program, created in 1972. BEOGs—later named Pell Grants, after their principal sponsor, the Rhode Island senator Claiborne Pell—are intended to provide a financial-aid floor for the country's poorest families. In 1985 the Pell Grant program cost \$3.6 billion and provided awards to some 2.8 million students. Having bolstered its efforts in behalf of the disadvantaged, Congress in 1978 looked to a broader constituency by passing the Middle Income Student Assistance Act. Among other things, the law expanded access to GSLs, so that any student, regardless of means, could borrow money at a guaranteed interest rate of seven percent. The Middle Income Student Assistance Act took effect just as the prime rate started climbing toward 20 percent.

TODAY THE FEDERAL government's need-based student-aid system consists primarily of three grant programs, two loan programs, and a work-study program. Washington's generosity has brought higher education within the reach of many who would otherwise have been unable to afford it. But the federal effort has been plagued by inequity and inefficiency.

The complexity of the system is recognized by any family that has had to patch together six or eight different sources of funding in order to pay college tuition. Consider an actual case—that of a promising but needy student attending a private college in New York state in 1983. She was an "independent student" (her mother was dead, her father was unemployed, and she was on her own). In her senior year she faced tuition, fees, and living expenses of nearly \$9,000. Her financial-aid package included the following: a \$1,700 Pell Grant, a \$2,500 Guaranteed Student Loan, and a \$500 National Direct Student Loan from the federal government; a \$1,800 Tuition Assistance Program grant from the state of New York; a \$1,500 scholarship from her college; and \$800 from her summer earnings.

This student's financial-aid package is not out of the ordinary. It reflects a way of doling out the dollars that has become routine. Of the federal government's major aid programs, three are administered on campus by college personnel, one is run by banks and state agencies, one by state governments, and one by a private contractor.

A separate problem is that of equity. During the past decade a fundamental and virtually haphazard shift in the focus of Washington's efforts has taken place: a declining share of student-aid money is being spent to help the very poor; an increasing proportion has been channeled to the middle class. The Pell Grant program was intended to be the centerpiece of student aid for the poor, but the size of the grants has failed to keep up with either inflation or the rising cost of going to college. (From 1972 to 1985 the maximum size of a Pell Grant increased by 50 percent and the Consumer Price Index by almost 160 percent.) This has occurred in part because the Pell Grant program depends on annual appropriations from Congress; in a period of tight budgets and high federal deficits, increases have not been forthcoming. The Guaranteed Student Loan program, in contrast, is an entitle-

ment: Washington must foot the bill for anyone who meets the eligibility criteria. Students from poor families, of course, generally meet those criteria. But so do many students from middle-income families. As a result, loans make up an increasingly large part of the federal-aid picture. The loan share of student aid made possible by Washington increased from 26 percent to 52 percent from 1978 to 1985, while the grant share dropped from 70 percent to 45 percent.

There is an economic law of sorts that whatever one subsidizes one gets more of. In the case of student loans, by subsidizing loans to people whose incomes fall below a certain threshold Washington creates an incentive for families to keep their nominal incomes below that level. With astute financial planning some families can shelter a great deal of income. The eligibility requirements for Guaranteed Student Loans are, in truth, very generous. Students from families with an adjusted gross income (not total income) of \$30,000 or less a year are entitled to a subsidized loan—no matter what the actual cost of the college they may be attending, as long as they are enrolled at least half time. Students whose household income exceeds the \$30,000-a-year threshold may be eligible for a loan, depending upon the results of a "needs test."

Needs analysis relates a student's, and his family's, resources to the cost of education. It is decentralized—carried out in accord with federal guidelines by campus-based financial-aid counselors or private companies. Several needs-test formulas exist. The newest of these, known as the Guaranteed Student Loan Methodology, was created in 1981. It is fairly simple, relying solely on family size and adjusted gross income to determine the expected family contribution for each child's college education. If the expected contribution is less than the cost of college, the student is eligible for a Guaranteed Student Loan. This formula, designed for families with adjusted gross incomes of \$30,000 to \$75,000, has a great deal of give. For example, it assumes that a family has no assets—no stocks, no bonds, no savings accounts.

Not all of the needs-analysis formulas work this way. Under the so-called Uniform Methodology, assets are counted very carefully. Indeed, a student may be ineligible for a loan because his family conscientiously scrimped and saved for college—and thereby has substantial savings—while a classmate from a fam-

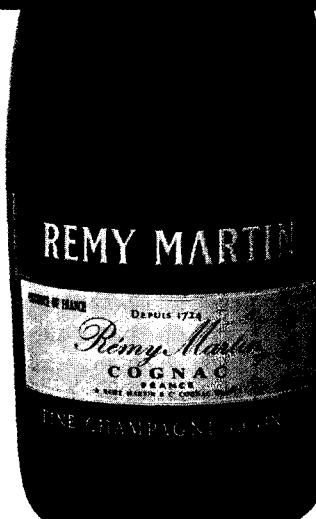
ily with identical income receives aid because his parents squandered every penny and have no assets to show.

Regardless of who is getting student-aid money, a good bit of it is either being misspent or, in the case of loans, going unrecovered. Roughly \$4 billion in loans made available under the Guaranteed Student Loan program is now in default—the sum has more than doubled during the past four years. Despite increasingly vigorous collection efforts, the default rate hovers at around 10 percent. This year the U.S. Department of Education will spend nearly \$1.2 billion to pay off defaulted loans.

The situation is likely to get worse. The Department of Education estimates that default payments will be almost \$2 billion annually by 1990. Part of the problem is that an increasingly large percentage of borrowers are "high-risk" (poor, minority) students who attend "high-risk" institutions. The data are sketchy, but apparently defaults are most likely among students attending private trade schools—schools of cosmetology, drafting, barbering, and the like. It is not hard to see why such schools are popular with students. The best of them have a practical outlook, are relatively inexpensive, adapt quickly to changing market demands, and have a strong interest in finding jobs for their graduates. But among the 4,400 trade schools that participate in the GSL program, some are of poor quality and enroll all applicants regardless of ability. Others prey on disadvantaged youths unable to judge the merits of the educational program. High-pressure salesmen—often working on commission—roam the inner cities, signing up students and processing their loan applications. Ultimately, many of these students drop out. In California the GSL default rate among students who have attended private trade schools is about 25 percent. That compares with an eight-percent rate among borrowers who have attended four-year colleges in the state. In Pennsylvania, state officials contend that loan-default costs would be cut in half if thirty of the state's nearly 600 eligible post-secondary institutions were barred from receiving federally subsidized loans. Of those thirty schools, twenty-six are private trade schools.

The Pell Grant program has its problems too. One recent study found that 25 percent of Pell Grants are awarded in improper amounts. Three quarters of the mistakes, or nearly 19 percent of

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the awards, involve overpayments—a level that, according to the Office of Management and Budget, exceeds the overpayment rates for Aid to Families with Dependent Children, Food Stamps, and Medicaid. Part of the trouble has to do with unintentional mistakes, prompted by the complexity of the application form. However, a large share is the result of fraud. For example, many applicants who are financially dependent on their parents claim that they are independent in order to increase the size of their grants. Abuses like this were identified in a quality-control survey commissioned recently by the Department of Education. A similar investigation by the General Accounting Office, a research arm of Congress, reached the same conclusion: errors in the Pell program are widespread and expensive.

THE TROUBLE WITH overhauling the student-aid system is that it is plagued not only by a handful of big and obvious problems but also by dozens of systemic ones—problems that may have less to do with the intent of a law or the adequacy of an appropriation than with the way a bureaucracy is structured, a regulation is written, a form is composed. Congress and the executive branch may intervene from time to time to correct some defect that is simply too gross to ignore. But the underlying flaws in the system are immune to mere tinkering—and tinkering seems to represent the upper limit of what is politically possible at present.

Washington did deal decisively with the Middle Income Student Assistance program, which proved to be an acute embarrassment soon after its creation. The heavily subsidized loans of convenience for anyone in college quickly became a source of money for a lot more than tuition. *House and Garden* recommended that parents use low-cost student loans to help finance a project like home remodeling. *Money* magazine announced, "College Loans at 7%—For Everybody." It was all perfectly legal, and the result was an explosion in borrowing. Congress cut back the expanded loan eligibility in 1981, but it did so because federal social spending was being cut across the board, not because it was appalled at the misuse of student-aid money by middle-income families.

As for loan defaults, the government is trying. In 1984 Congress authorized the Internal Revenue Service to with-

hold income-tax refunds from the two million former students who have defaulted on their loans. Withholding will begin this year. The Department of Education has provided collection agencies with the names of some 400,000 defaulters, and the names of another 16,000 defaulters have been turned over to the Justice Department for possible legal action. All of these steps will help, but no one predicts that the number of loans in default—and, consequently, the amount of money that the government must repay—will do anything but grow. In all likelihood, it will grow until post-secondary institutions and lenders are given some incentive to make sure that student loans are repaid. Currently they have none.

There is no shortage of proposals for improving the system. For example: Reduce the federal guarantee on student-aid bank loans, to perhaps 90 percent—thereby giving the lenders an incentive to track down former students who are in default. Remove schools with high default rates from eligibility for federal assistance. Make needs analysis for student loans universal, rigorous, and consistent. Above all, expand the Pell Grant program for needy students. Disadvantaged students with high potential need to have costs defrayed, not deferred. A recent Carnegie Foundation study concluded that among disadvantaged students with little financial savvy, the prospect of graduating from college deeply in debt deters many from even considering higher education and prompts others to drop out before their studies are completed.

Still another set of proposals would improve federal management of student aid. Despite all the money it devotes to helping students, the Department of Education knows virtually nothing about the students that get it, how much they get, how it influences their educational experience, or what they do after college.

More-comprehensive ideas have also been circulating. Representative Thomas Petri, of Wisconsin, and others have proposed the creation of a National Student Loan Bank, which would issue loans from the Treasury directly to students. Students would pay off loans out of future income, through the Internal Revenue Service. The availability of loans to eligible students would be guaranteed, but the banks would be out of the picture. Such a system might be income-contingent (as Petri proposes):

college graduates with low earnings might repay less on their loans every year than graduates with higher earnings. This would at least diminish the implicit penalty (that now exists) for undertaking a career in an ill-paid but socially useful occupation—such as teaching in an inner-city school—while garnering a modest surtax from those who prosper in the marketplace as doctors and business executives. Others have suggested creating a national-service option, allowing students to work off a portion of their debt. This would bring the student-aid system full circle, back to its roots in the GI Bill—a quid for a quo.

All of these points and proposals were raised and aired during extensive hearings last year when the House Postsecondary Education Subcommittee considered reauthorization of the Higher Education Act. After almost a year of effort, the full House of Representatives voted in December to make a few adjustments. The House would, for example, require a means test for all loan applicants, eliminate the Guaranteed Student Loan Methodology, and tighten the definition of an "independent student." Such reforms are simply designed to prop up the current system, and it is unclear whether the Senate will accept even these modest changes.

If the student-aid system is not overhauled—piecemeal or of a piece—it will become an increasingly attractive target for budget-cutters in the White House and on Capitol Hill. Indeed, some budget cuts appear almost inevitable. As part of its August, 1985, budget compromise, Congress promised to reduce spending in the Guaranteed Student Loan program by \$800 million. The danger in letting the budget process drive student-aid policy is that budget-cutting is a blunt instrument. Tough decisions do get made, but not all tough decisions are wise ones. The best time for reform is during reauthorization, when policy-makers have the chance to take a long, careful look before making any moves. And yet, a year after Secretary Bennett's inflammatory remarks, the executive branch is nowhere to be seen. The Department of Education has delayed until this month unveiling whatever ideas it has. So far the Administration's harsh rhetoric has simply polarized the debate. The prospects for significant reform, already dim, have become dimmer still.

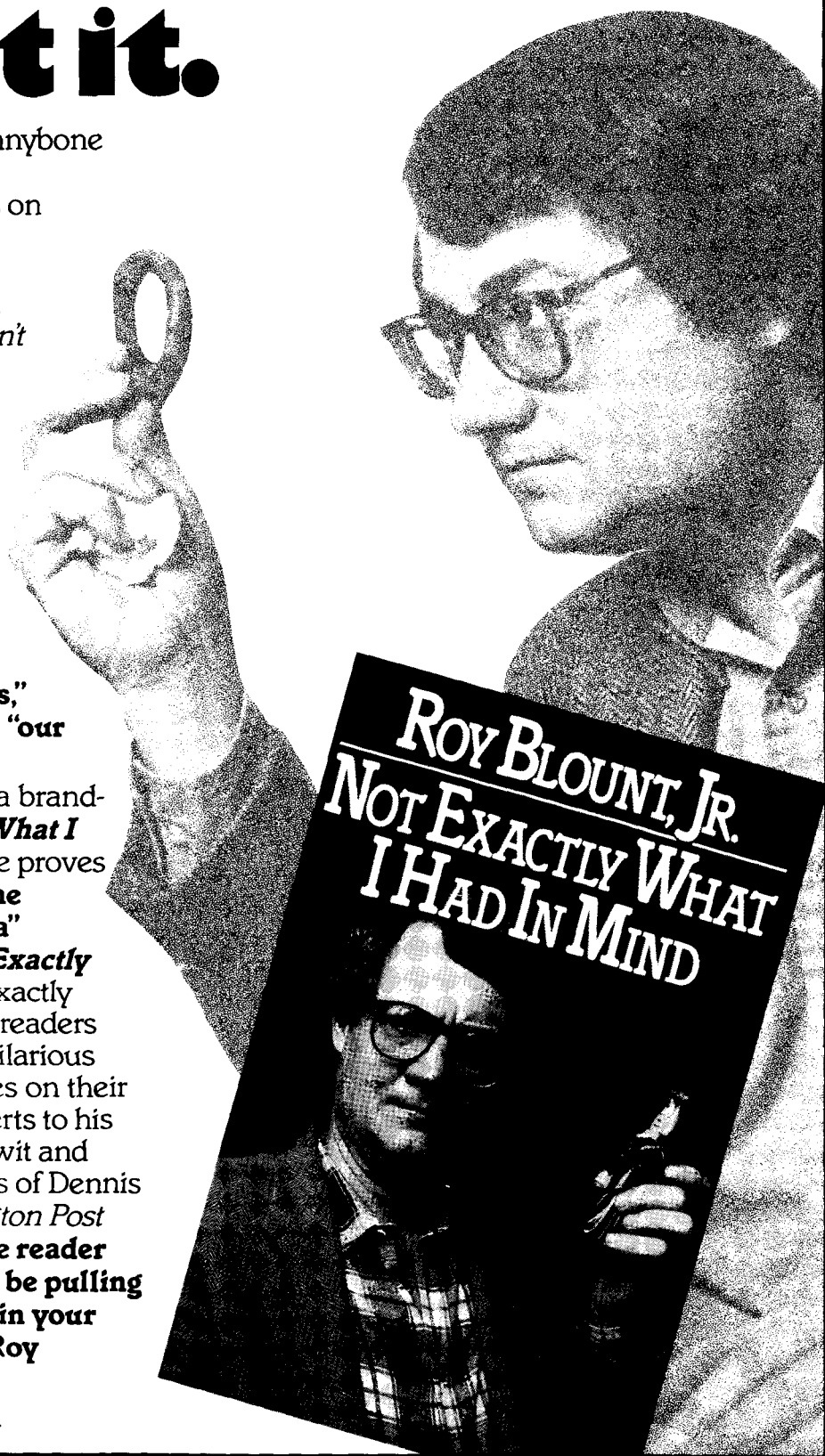
—Denis P. Doyle and Terry W. Hartle

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STORIA DELL'ARTE 101

BY JOHN HARRIS



HAVING JUST RETURNED from Italy, I am something of an authority on the art of the Quattrocento. Not everyone is so lucky, however, and many an art-lover is discouraged by the forbidding subject matter and arcane symbolism of Italian Renaissance art. To aid the uninitiated I have compiled a brief guide to the iconography found in Quattrocento painting and sculpture. I hope that readers find this information useful. As the Italians say, *Vietato ingresso!*

Plants and Flowers

- *Poison ivy* symbolizes the devil and his works. In medieval Europe poison ivy was frequently burned in bonfires, often with heretics as kindling. Saint Augustine, in his *De trinitate*, likens the urgings of the flesh to the itch of poison ivy: "Even as the skin is irritated by the juice of this plant, so a man may break out in hives at the sight of a fair bosom."
- *Violets* are the flowers associated with Saint Doris of Lucca, who distributed them to the poor in lieu of alms. The poor evinced their lack of appreciation by stoning Saint Doris in 618.
- *Larkspur* is the flower of vanity. Saint Marmo of Naples is reputed to have cultivated larkspur within the confines of his monastic cell. When this impiety was discovered by his father superior, Saint Marmo was banished to a convent, where he lived out his days as Sister An-

gelica, performing many good works and eventually becoming prioress before his death in 1121.

- *Gladiolus* signify tranquillity. According to the apocryphal Book of Jane, the Virgin cultivated gladiolus while living in Egypt and frequently served them in salads.

Animals

- The *duck* is the symbol of Saint Simon Dolomite. According to legend, the ducks of Como were being preyed upon by ravening wolves. In desperation the birds turned for help to Saint Simon, who was taking the cure at a nearby resort. Through the power of prayer Saint Simon provided the ducks with a thick, armadillo-like covering, which protected them from their enemies. Though now unable to fly, the ducks were thankful for the Saint's help, and, the legend says, when Saint Simon died they all swam out into Lake Como and drowned.
- The *gerbil* is associated with Saint Stella of Brindisi. According to the *Legende Risibile* of the eighth century, a wild gerbil was terrorizing the populace of Brindisi. When Saint Stella learned of the situation, she immediately sought out the gerbil and reasoned with it. The gerbil listened to her plea and, in an act of contrition, turned into a hamster.
- Saint Familia is usually symbolized by

a *turtle*. Contemporary accounts agree that she looked like a turtle.

- For obvious reasons the lone *porcupine* is the symbol of the contemplative life in the art of the Quattrocento. Interestingly enough, *two* porcupines symbolize the active life.
- The *giraffe* is a symbol of sloth. In his unmailed "Epistle to Justinian Martyr," the fourth-century scholiast and bon vivant Euromycin wrote that the Magi originally set out for Jerusalem on giraffes. Somewhere in Asia Minor the giraffes were overcome with fatigue, whereupon the Magi procured the now familiar camels and so completed their journey. In embarrassment the giraffes later fled to Africa, where they have remained ever since.

Fruits and Vegetables

- *Bananas* symbolize luxury. Bananas were unknown in medieval Europe until Paolo Polo, the younger brother of the better-known Marco, returned from his apocryphal travels in Africa with fabulous tales of the "*Uomo di Banane*" (Banana Man). Word of this person quickly spread, and so the banana became a symbol of worldly riches, while the Banana Man went on to become a noted television personality in the 1950s.
- The *onion* is associated with the beautiful legend of Saint Rudolph. When

Saint Rudolph arrived in Arezzo, penniless and starving, he asked a poor fisherman for food. Though the fisherman's family was hungry and clothed in rags, he said to the Saint, "Here. Have an onion."

- The *cucumber* was considered the vegetable of humility, perhaps because of its prominent place in the diet of the Withdrawn Sisters, a short-lived sect based in Orvieto. Students of iconography often mistake it for the zucchini, which was a symbol of either gluttony or lust, depending on its availability.

- The *cabbage* is the symbol of Saint Egregio of Padua, who, as an act of penance, subsisted on a revolting diet of uncooked cabbage leaves and rainwater. This practice, combined with his peculiar views on personal hygiene and his abrasive and accusatory oratorical style, led to his death in 460 at the hands of an already converted populace, making him the only saint to be martyred for his personality rather than his faith.

Other Symbols

- A *halo of coins* symbolizes Saint Pranzo, the so-called Medici Saint, who was a financial adviser to and close family friend of the great Florentine banking dynasty. His business acumen and intense piety made him famous as "Saint Francis of the Rich."

- The *brachino* (a tiny musical instrument resembling a tonette) is the symbol of Saint Vyvyan of Cortona. Saint Vyvyan's abilities on the *brachino* were legendary: tales circulated of hardened skeptics who were reduced to tears by the sounds he produced. Saint Vyvyan eventually sought to convert the Ottoman Empire through the power of his music. In an extraordinary interview in 1386 he played his *brachino* before Emperor Murad I, who, obviously moved, ordered his immediate execution.

- The *pensione* is the symbol of Saint Maureen of Ravenna, who is often pictured holding a pensione in her hands. Her biographer tells us that Saint Maureen was won to the Church while wandering the streets of Florence at the height of the tourist season, vainly looking for a place to stay.

- As a result of a misreading of the Book of Isaiah, Renaissance commentators held that a *half-filled beaker* represents the Old Dispensation; a *filled beaker* stands for the New Dispensation; an *empty beaker* means the end of the world. □

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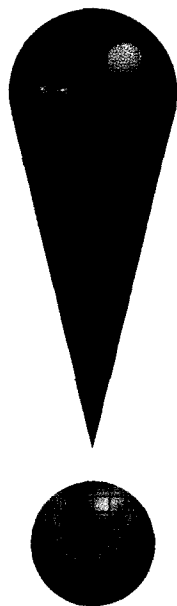
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If Thomas Gold is right, most oil and gas is not of biological origin, and there is more of it than geologists have imagined

THE ORIGIN OF PETROLEUM

BY DAVID OSBORNE

ONE HUNDRED AND FIFTY MILES NORTHWEST OF Stockholm lies a twenty-six-mile-wide geological formation known to scientists as the Siljan Ring. The Swedes, who flock there every summer, know it as the home of Lake Siljan, their favorite summer resort. It is a land stripped of sediments by the Ice Age—a wilderness vista of granite outcroppings, thick forests, and innumerable ponds and lakes, not unlike the lake country of Ontario and northern Minnesota.

This June, if everything goes as planned, a power company owned by the Swedish government will set up a drill rig deep in the woods of the Siljan Ring, out of sight of the vacationers. The drillers will build a derrick some twenty stories high and mount a drill bit made of diamond or tungsten carbide. Slowly, steadily, for the next year or more, this drill will chew its way through the granite. As each bit wears itself out on the rocks, technicians will pull the entire drill string up and put a new bit into place. Eventually the drill will penetrate to 5,000 meters—more than three miles beneath the surface.

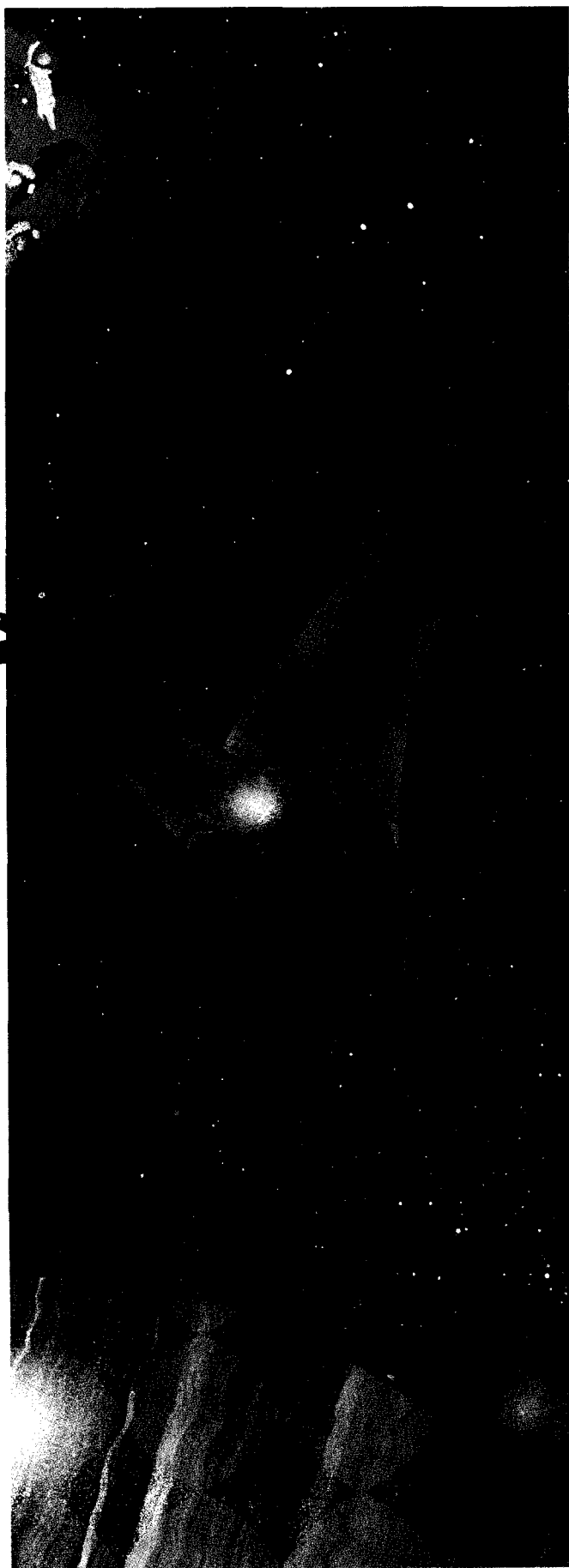
The Swedes are looking for oil or gas. If they find either, all our notions about the origin of petroleum may crumble, and with them our fears of ever running out of fuel.

The textbooks tell us that oil and gas, or hydrocarbons, are formed from plant and animal material that was buried in sediments millions of years ago—hence the term *fossil fuels*. This was not always the prevailing view. In the early days of petroleum exploration many scientists postulated

that hydrocarbons leaked upward from materials buried within the Earth during its formation. A significant minority of Soviet geologists still hold this view. The world's deepest well, in fact, was begun by a Soviet team that will eventually punch several holes almost ten miles into the Earth, in part for research on the origin of oil and gas. (Before the Soviet experiment an Oklahoma gas well held the record, at roughly six miles.)

The Swedes are drilling in granite shield so old that no sediments—the source materials from which oil and gas are believed to come—could lie beneath it. Normally, granite is not porous enough to hold more than traces of oil or gas. But 360 million years ago a giant meteorite crashed to earth in Sweden, creating the Siljan Ring—the largest known impact structure in Europe—and pulverizing the rocky depths beneath it. When a meteorite smashes into granite, it creates the equivalent of an enormous pile of gravel. If oil and gas were migrating up from the Earth's depths, that pile would provide a perfect migration route. If the route were sealed shut at any level by the weight of the overlying rock, or by minerals laid down by a migrating gas or liquid, the impact crater could be a vast reservoir. The Swedes are looking for such a reservoir.

The Siljan drilling program is the brainchild not of Swedish petroleum geologists but of an astrophysicist at Cornell University named Thomas Gold. Gold, who founded and for two decades directed Cornell's Center for Radiophysics and Space Research, is an unusual man.



Trained as an engineer, he turned to astronomy largely because it posed problems that intrigued him.

Gold has always been a maverick. He gained his first measure of fame at age twenty-eight, as the originator, with Herman Bondi and Fred Hoyle, of the then revolutionary steady-state theory of the universe. (Out of favor since the big-bang theory gained acceptance, the steady-state theory holds that the universe is in a constant state of expansion, with new matter coming into existence as the galaxies rush apart.) In the thirty-seven years since, he has ranged over vast scientific terrain, breaking new ground in magneto-hydrodynamics (the explanation of solar flares, for instance), geophysics (proof that the Earth's poles change position over time), even physiology (new insight into the workings of the inner ear). As an adviser to the National Aeronautics and Space Administration's moon program, he kicked up a storm with his lonely—and correct, as it turned out—insistence that the moon's surface was not hard rock, for which the astronauts were being trained, but fine dust.

As an astronomer, Gold long ago studied the process by which gases migrate out of the planets. He knew that hydrocarbons had been found in some meteorites, where no plant or animal life was thought ever to have existed. As NASA's planetary probes radioed back their data, he learned that hydrocarbons were even more common on other planets. In 1977 Gold read a newspaper report of the discovery of vast amounts of natural gas, dissolved under great pressure in hot salt water, deep under the Gulf of Mexico and the Gulf states. The discovery recalled his earlier conviction that the Earth itself had leaked, or "out-gassed," hydrocarbons. In 1979 he published the first in a series of papers contending that on Earth, as on other planets, most hydrocarbons were formed from nonbiological sources.

As Gold sees it, primordial materials that were buried deep within the forming Earth have been cooking for 4.5 billion years. If some of those materials resemble certain meteorites, they would give off hydrocarbons as they cooked. This oil and gas would build up tremendous pressure as they accumulated, and would eventually burst up through cracks and fissures in the Earth's crust. Conventional wisdom says that when oil molecules are subjected to the fiery temperatures found below about three miles they break down into methane—the simplest hydrocarbon, with one carbon atom and four hydrogen atoms, and thus the most stable. But Gold believes that the extraordinary pressure found tens of miles beneath the surface would allow oil molecules to survive. As pressure decreased near the surface, he agrees, they would begin to crack apart. Some oil would reach the first two or three miles of crust, where it could survive, before it had completely "dissociated." But most oil molecules trapped below three miles would break down into methane. Hence our drills may already have found much of the world's oil, but not its methane—which we know as natural gas.

If Gold is right, the Earth may contain a virtually inex-

haustible supply of gas. Huge reservoirs may exist where geologists have never thought to look. The world's poorest countries, such as those of East Africa, may be resource rich. Nearly every nation may have some oil or gas. "I'm quite confident that we could produce gas at the oil-equivalent price of twenty to twenty-five dollars a barrel in many parts of the world, including many countries where the petroleum geologists have said it's absolutely hopeless," Gold says.

The implications are startling. OPEC might be doomed. Nuclear power would be unnecessary; likewise the gasification of coal. The air would become clearer, since methane is our cleanest fuel. Acid rain would abate. And the greenhouse effect—a buildup of carbon dioxide thought to be warming the planet to dangerous levels—would be slowed, for methane, when burned, releases much less carbon than oil or coal does. In short, Gold's theory promises a modern miracle.

THE TANTALIZING POSSIBILITY THAT GOLD MIGHT BE right has drawn his hypothesis ever closer to respectability. A small but growing band of scientists has taken up the cause. The Gas Research Institute (GRI), a research-and-development consortium financed by the gas utilities and pipelines, is pumping \$2 million a year into research on the subject, including the Siljan Ring drilling program. Variants of the deep-gas hypothesis have sprung up, such as the notion that sediments long ago "subducted" deep into the Earth—dragged under as one continental plate slid over another—are giving off gas. A handful of drillers and prospectors share Gold's view. Among the most prominent of them is Robert Hefner III, the president of a large gas-drilling company in Oklahoma. Twenty years ago Hefner was almost alone in predicting that gas not only could survive but also would be abundant below 15,000 feet. He was right then, and he believes that Gold is right today. "The numbers are just so vast, I doubt that all deep gas could come from biological origins," he says. "When I got out of school, the geologists told me that gas couldn't be that deep. Well, those are the people who disagree with Gold now."

Words like these send many petroleum geologists into virtual apoplexy. Most consider Gold's hypothesis preposterous. As one put it, "It's on about the same level—and I'm not being facetious—as saying sugar-plum fairies will cure cancer."

But fundamental insights into the nature of the Earth have come from outside the profession before. Alfred Wegener, who first proposed the theory of continental drift—that continents radically change their positions over millions of years—was a meteorologist. For decades Wegener was ignored or laughed at; recent experiments involving lasers and radiotelescopes suggest that, indeed, the continents are moving relative to one another (although the accepted mechanism is different from Wegener's). "The earth sciences are fairly bound by conventional wisdom,"

explains Charles Drake, an earth scientist at Dartmouth. "Cosmologists aren't."

The president of the Gas Research Institute, Henry Linden, is one of Gold's most enthusiastic supporters. He compares Gold's hypothesis to the first arguments that the Earth was round or that the Earth revolved around the sun. "They drew maps assuming the world was flat, and they could navigate the oceans," he says. "You could still tell time and develop calendars and do all sorts of things you needed for an advanced civilization, thinking the Earth stood still and everything else revolved around it."

In the same way, Linden believes, petroleum geologists have been able to find oil and gas in spite of their fault theory. Like earlier scientists, they respond vehemently when someone questions their assumptions, which appear to have worked quite well for years. "It's just an extremely upsetting and seminal theory to the traditional geoscientists. They have great difficulty in coping with it," he said.

TOMMY GOLD, AS HE IS KNOWN THROUGHOUT THE scientific community, is no stranger to controversy. He takes great pleasure in twitting the scientific establishment, though in 1984 he was awarded one of his profession's highest honors, the Gold Medal of the Royal Astronomical Society.

The relish with which Gold steps out on scientific limbs was never more apparent than in 1968, after astronomers at Cambridge University reported a series of precisely periodic radio signals—which they labeled pulsars—from an unknown source in outer space. While serving as a deputy to the Astronomer Royal in Britain, Gold had written about the possible existence of stars so dense that one cubic centimeter of their mass would weigh over a billion tons. If they existed, he now reasoned, they would rotate very rapidly, like figure skaters who spin faster as they tuck in their arms. As they spun, they would fling off charged gases, creating beams of radiation that would sweep around like lighthouse beacons and be heard as radio pulses.

Predicting what astronomers would find when they listened more closely, Gold published his theory in the British scientific journal *Nature*. When an international conference was organized to discuss the pulsar discovery, however, he was refused five minutes to speak. "I was told that if we let that in," he remembers with amusement, "we'd have to let anything in." Within months all of Gold's predictions had been confirmed, and his theory was widely accepted.

The pulsar episode cemented Gold's fame. It also, he says today, "confirmed me in my belief that one must on no account be curbed by the opinions of one's competitors in science."

In person, Gold hardly seems the type to be a scientific visionary. One sees no wild mane, no harried disarray. Instead one finds a slight and impeccably dressed man of six-

ty-five, who looks a decade younger. Born in Austria, educated in Switzerland and England, Gold retains traces of both the Austrian and English accents. After twenty-seven years in the United States, the European gentleman is still quite apparent, despite Gold's enthusiasm for such unexpected pursuits as skiing and tightrope-walking.

In conversation Gold operates with the grace and subtle formality of a cultured European. Though his eyes are quick to crinkle in amusement, he addresses people as Mr. or Mrs. until invited to do otherwise. When he gets his teeth into a line of argument, however, he loses himself. The words come faster, the volume rises, the points are made with great clarity and persuasiveness. When confronted with opposition he considers foolish, Gold gives no quarter. His arguments slash through his opponents'; his questions ridicule their logic. Many who have encountered him in the heat of argument consider him overbearing. One frustrated scientist remarked to a reporter after a NASA conference, "I wish I could put across what I believe is right as well as Tommy Gold can put across what I believe is wrong."

Gold loves explaining how things work—"taking the back off the watch," as he puts it. In the midst of a description of some complex chemical interaction he will often point out that the reaction involved also occurs in some everyday process we take for granted, such as the production of steel from iron in an open-hearth furnace. This gives one the sense that the world is indeed simple, if one only understands the basics. It also makes Gold an excellent—and popular—teacher.

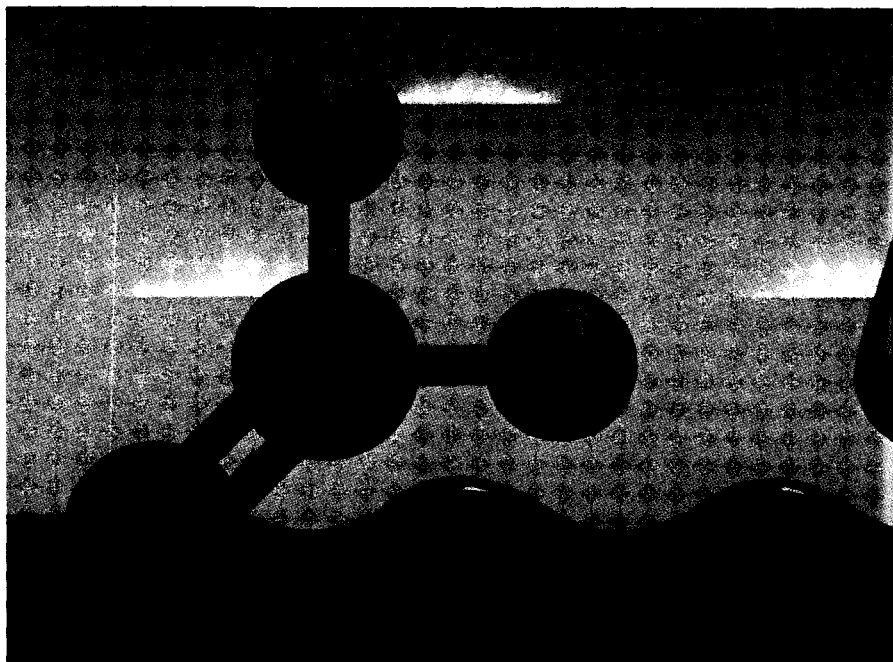
In an age of increasing specialization Gold is atypical. What seems to distinguish him from the average scientist, and allow him to range so widely, is an uncanny ability to see through the surface of phenomena to their basic workings. "He has a very intuitive feel for complex physical processes," says Steven Soter, a colleague at Cornell and the co-author of several of Gold's deep-gas papers. "He senses what is the heart of the matter, which I think comes from a real understanding of the basics."

GOLD FIRST PONDERED THE ORIGIN OF HYDROCARBONS more than thirty years ago, while examining the process by which carbon and other surface elements migrate out of the planets. At the time, he concluded that the carbon in the forming planets would most likely have occurred in unoxidized form—in compounds without oxygen. The two most stable carbon-bearing gases are methane (CH_4) and carbon dioxide (CO_2). Gold believed that substances capable of releasing methane were far more likely to have been present as the Earth formed, and thus to have contributed its supply of carbon. Most ge-

ologists, however, assumed that the Earth's carbon had come up as carbon dioxide, and that methane had formed only after plants incorporated this carbon through photosynthesis. That struck Gold as peculiar. Someday, he told himself, he ought to look into it.

In the years since, thanks to the space program, scientists have learned that most of the carbon in the other planets is in the form of hydrocarbons. "Jupiter, Saturn, Uranus, and Neptune have large admixtures of carbon in their extensive atmospheres, chiefly in the form of hydrocarbons—mainly methane," Gold explains. "Titan, the satellite of Saturn, has methane and ethane in its atmosphere. Its clouds are composed of these substances, and liquid methane-ethane mixes are probably on the surface below and perhaps make up oceans, rivers, and frozen polar caps more or less as water does on Earth."

Neither plant nor animal life seems likely to have exist-



ed on Saturn or Titan—or on the meteorites. But, according to Harold Urey, the Nobel laureate who pioneered cosmochemistry, "if found in terrestrial objects, some substances in meteorites would be regarded as indisputably biological. . . ."

The meteorites that Urey is referring to, known as carbonaceous chondrites, are similar to some of the materials thought to have formed the Earth. Although most meteorites have been traveling through space for billions of years, others fell into the forming planet, bringing with them the elements most common in living things and in the atmosphere. Without these meteorites we might not have our present oceans, nor our store of carbon. If heated deep within the Earth, Gold reasons, this primordial material would release methane and other hydrocarbons, which would then rise toward the surface.

Gold acknowledges that some oil and gas was produced biologically. The conventional explanation goes some-

thing like this: As plants and animals die, their remains collect in sedimentary basins, particularly where rivers dump silt into the sea. Over time, as these sediments are buried and compressed, the organic matter forms complex, tar-like molecules called kerogen. The deeper the burial, the greater the pressure from overlying rock and the higher the temperature. As pressure and temperature increase, the kerogen is gradually cooked into the complex molecules of carbon and hydrogen (C_8H_{18} , $C_{19}H_{40}$, and so on) that we call oil. The oil then migrates out of the source rock, as it is known, into more porous areas, where it is eventually trapped under some kind of impermeable cap rock and forms a reservoir.

Methane is produced when kerogen or the subsequent oil is subjected to even higher temperatures. At roughly 250 to 400 degrees Fahrenheit the complex oil molecules begin to crack apart. If heated long enough, they will all

process must have taken away all that oxygen. What was that process? The best answer available was photosynthesis—sunlight on the plants.”

Michel T. Halbouty, one of America's leading oil explorationists, began his career in 1931, when the biological theory was still being established. “The conclusion that oil and gas were biogenic [from biological sources] came because we needed a theory to explain their origin,” he says. “We found all these fossils and everything else in the sediments, and we came to the conclusion that thousands upon millions of these things were buried there and that a chemical reaction had taken place that created oil and gas.” But had scientists known then what they know now about hydrocarbons on other planets and in meteorites, Halbouty says, “I believe that in conjunction with that biogenic conclusion we would have added that abiogenic sources might also be possible.”

Another factor influencing the geologists was the combination of gases brought up from the Earth's depths by volcanoes. (Volcanic lava normally originates in the mantle, the region below the six-to-forty-mile-thick crust and above the core.) Because geologists found a great deal of carbon dioxide and very little methane in volcanic lava, they concluded that most of the Earth's carbon had come up as carbon dioxide. When Gold saw this in the geology textbooks, he understood the contradiction that had puzzled him thirty years before. “That was, in fact, my original point of departure from the conventional discussion, because as soon as I read this statement in the geology textbooks, I realized that they were all absolutely, grossly, in error,” he says. “Anyone with the merest chemistry education can see that in most lavas—in liquid rock, in other words—methane streaming through would be very largely converted into carbon dioxide. The lavas have enough oxygen available in them to burn methane in the lava before it comes out the top. Therefore, the fact that volcanoes produce carbon mainly in the form of carbon dioxide didn't add any information about what gas it was that came up from below.”

Gold saw no Earth-forming substance that would logically produce carbon dioxide in the Earth's depths. Hence he assumed that the original carbon-bearing substances were hydrocarbons. In a “hot path,” like a volcano, most of the oil or gas would burn up, leaving carbon dioxide. (This is essentially what happens when oil or gas burns in a furnace: the carbon and the hydrogen atoms react with oxygen, producing carbon dioxide and water vapor. The reaction is known as fire.) Along cooler paths—faults, deep rifts, continental-plate boundaries, and other fissures in the Earth's crust—most of the hydrocarbon molecules would survive. As they rose, some would be trapped under cap rocks, creating reservoirs. Some would dissolve in ex-



eventually break down into simple structures, principally methane and a residue of pure carbon. In addition, certain kinds of organic matter are believed to produce methane directly, and coal seams give off methane when cooked. Methane is also known to be produced at shallow levels by the action of tiny microbes on sediments—or garbage, or even food in one's digestive tract. This microbial methane is quite common; a shaft dug into an old garbage dump will usually find some.

If hydrocarbons had been found in meteorites and other planets before they were found in the Earth, Gold believes, the biological theory would never have become the sole explanation. “As it was,” he says, “early scientists had no idea what happened outside the Earth at all. They dug around in the Earth. They found that almost everything on the surface was heavily oxidized, and then they found a few patches of materials that were not oxidized, quite out of whack with their surroundings. They said, ‘Well, some

isting reservoirs of biological oil or gas, augmenting them. Some might break down at high temperatures, leaving carbon behind and giving off hydrogen, which would migrate up and perhaps enrich biological supplies of oil. And some might create or enrich coal deposits—a subject that Gold will explore in detail for the first time in a chapter of a book he is now completing.

Looking at fault and rift zones, Gold noticed what to his eyes seemed a strong relationship to the Earth's known reservoirs of oil and gas. He argues that wherever a deep fracture in the crust co-exists with a sedimentary basin, which provides the porous reservoir rock, oil and gas are found. Most of the Middle East oil lies along continental-plate boundaries, where the African, Eurasian, and Arabian plates are pulling and pushing against each other. Rich hydrocarbon deposits exist along a seismically and volcanically active line all the way from New Guinea through Indonesia into Burma and China. Along that line they are found in oceans and valleys and mountains, in sediments with totally different geological histories. In the United States, oil-rich areas include the overthrust belt of the Rockies (where one slice of crust has been pushed up over another), the vicinity of California's San Andreas Fault, and mid-continent regions overlying ancient rifts, such as Oklahoma and Texas. Not all petroleum geologists agree that there is a relationship between fault and rift zones and hydrocarbons, but those who do offer their own explanations. They argue that faults create more efficient traps for oil and gas, and that the supply of heat from the mantle along rifts and in volcanic zones cooks the sediments more thoroughly.

Migration from below, Gold reasoned, would also explain why many oil and gas reservoirs are stacked one on top of another, in sedimentary rocks formed during very different geological epochs. To explain this, most geologists have to assume that huge volumes of organic matter were dumped in the same areas time and again, as oceans surged and receded, continents moved hundreds of miles, and the patterns of plant life changed completely. William Duchscherer, Jr., the president of Geochemical Surveys, Inc., is among those who believe that Gold is right. "Why should reservoirs be stacked on top of each other, when they're in entirely different geological environments?" he asks. "We have seen many cases of this."

Upward migration would also explain why a mere thirty-three of 30,000 known oil fields hold half the world's known reserves. The Middle East is home to twenty-five of these giant fields, and to 60 percent of known oil reserves. Petroleum geologists offer an explanation for this phenomenon, too: that for millions of years the Persian Gulf was a vast sink for plant life, impermeable layers were then deposited to form huge cap rocks, and the entire region has since been barely disturbed by earthquakes or faulting, thus preserving the entire store.

Gold, however, finds it improbable that less than one percent of the Earth's surface would be so much richer in plant life, and produce so many more cap rocks, than any

other region. The Middle East is really some twenty different oil-bearing regions, he points out, each with different characteristics and each with huge oil reserves. "You could cut it into ten pieces and each of them would still be the world's best. So why would they all be close together? You have different source rocks, different cap rocks, different geological settings in the mountains of Persia, in the valley of the Tigris, and in the Gulf. Yet both source rocks and cap rocks are local phenomena. Many different locations, many different ages, and yet they are all packed together in a remarkably small area of the surface of the Earth. That is a strange coincidence."

Geologists still debate whether enough source rocks have been found in the Middle East to account for all the oil there. In addition, some point out that many of the Middle East oils are of quite similar chemical composition, despite the very different source rocks from which they purportedly migrated. The logical explanation for all of this, Gold argues, is that immense quantities of gas and oil have penetrated the crust as the continental plates in the area have pushed and pulled apart, over several billion years. Migration from below, he says, would actually favor the formation of these giant fields. Where biological deposits exist, they would make good traps for nonbiological hydrocarbons drifting upward. Those hydrocarbons would enlarge the reservoir, which would then trap more migrating gas and oil, enlarging the reservoir even further—and a continual expansion would occur.

Along the faults and rifts where oil and gas are found, earthquakes are common. Petroleum geologists believe that faulting helps create traps under which oil and gas are caught. But, Gold and Soter wrote in *Scientific American*, "one might think the repeated fracturing of the rocks in such a place would release or severely deplete any nearby accumulations of oil and gas. . . . The fact is that oil and gas fields show a distinct association with such earthquake-prone regions. The association suggests to us that the deep faults may provide a conduit for the continuous input of nonbiological methane streaming up from below. Moreover, the upward migration of methane and other gases in fault zones may contribute to the triggering of earthquakes"—perhaps by lubricating the surfaces between plates, allowing them to slip. The article went on to argue that bursts of methane (and other gases forced out of the earth) would explain many of the curious phenomena associated with earthquakes. Some of these phenomena, such as rising or bubbling water in wells and strange behavior by animals before tremors, have been used to predict earthquakes in China.

Some fault lines and plate boundaries are even associated with violent eruptions of methane known as mud volcanoes. These occur in many areas of the world, but they are most numerous and spectacular near the Caspian Sea, in the Soviet Union. Some are hundreds of yards high and several miles in diameter, and expel vast quantities of gas and mud, flinging rocks over hundreds of acres. Often the gas catches fire, and the flames burn for hours or days. In

one case, near the Caspian, reportedly flames burned to a height of two kilometers. In another, in Colombia, flames destroyed houses and trees five miles from the site.

The conventional view is that these eruptions are caused by vast quantities of biological methane, which builds up enormous pressure under its cap rock before finally exploding through. If this is the explanation, Gold and Soter asked, why do virtually all mud volcanoes lie on tectonic-plate boundaries? Some Soviet geologists who have studied mud volcanoes believe that the pressures and quantities involved—not to speak of the repeated eruptions over many years—are inconsistent with a biological origin for the gas. “A few thousand eruptions have occurred during the active period of the largest volcanoes,” according to N. A. Kudryavtsev, a Soviet petroleum geologist. “No reservoirs can explain that fact.”

WHEN GOLD FIRST PUBLISHED HIS THEORY, IN 1979, most petroleum geologists denied that nonbiological, or abiogenic, methane even existed. In recent years the debate has shifted ground. Today petroleum geologists contend that abiogenic methane does not exist in *commercial* quantities. Gold likens this argument to the excuse about the chambermaid’s baby, fathered by the son of the household: “But it’s such a *little* baby.”

In 1979 Dr. Harmon Craig, of the Scripps Institution of Oceanography, took a research submarine to the floor of the Pacific Ocean. There he collected gas samples from a spot known as the East Pacific Rise, where the ocean floor is spreading, hot lava from the mantle is pouring out, and biological sediments are absent. His discovery of small amounts of methane gave a dramatic boost to Gold’s theory. Craig and his colleagues have since found methane streaming out of every ocean rift or spreading area they have measured, and out of several underwater volcanoes as well. “The sea floor is spewing out methane everywhere you see volcanic activity,” Craig says.

In 1983 Craig presented his data at a conference attended by a dozen or so of Gold’s prominent critics, in Oak Ridge, Tennessee. The petroleum geologists accepted it as proof of abiogenic methane but focused on the quantities discovered. Using the amount of methane relative to helium emitted, Craig had estimated that perhaps 100,000 tons of abiogenic methane was released into the oceans every year. That is equal to about one tenth of one percent of the total carbon deposited in the sediments every year, or—making a wild guess, which is all geologists can do on this score—one to ten percent of the hydrocarbons produced biologically. Craig also reported finding roughly a hundred times as much carbon dioxide as methane.

To Gold’s critics, these figures proved that abiogenic methane exists in relatively insignificant amounts. Gold countered that because the East Pacific Rise is volcanic, most methane rising from below would be oxidized—turned into carbon dioxide. By this reasoning, the amounts measured say nothing about the total quantity of

methane in the mantle, or about the quantities present in areas where cool paths exist.

The opposing view was summed up by Dietrich Welte, a co-author of perhaps the best-known textbook on petroleum geology and an authority in the field. “I have no problem with the idea that there is abiogenic methane,” Welte said. “But it is so disseminated, it’s a trace in the rock. Commercially produced methane is probably ninety-nine-point-nine percent biogenic hydrocarbons, and on the average less than point-one percent abiogenic. There might be special situations where you have a bit more, but these are anomalies.”

Like most geologists, Welte believes that methane is dispersed through the mantle in such tiny amounts that it rarely accumulates enough pressure to force its way up through the rocks. The evidence that leads geologists to this conclusion comes from the liquids and gases trapped in rocks brought up from the mantle. Most of these rocks, which come up in volcanoes, contain carbon dioxide rather than methane. Some geologists warn, however, that we cannot be sure that the rocks have not fractured and reformed on the way up, allowing the trapped matter to oxidize. “What we see trapped in the rocks may be just an overprinting on top of their original signature,” says Jill Pasteris, an earth scientist at Washington University, in St. Louis. “So I think we have to be very careful about totally ruling things out.”

Pasteris also believes that too little of the mantle’s depths has been sampled to justify any definite conclusions. Indeed, others have found that methane predominates in a few mantle rocks, particularly some that bring up diamonds. (A few scientists, including Gold, believe that diamonds were formed from mantle methane, which dissociated to lay down pure carbon.) Other mantle rocks appear to contain much less oxygen than had been expected. This evidence has stirred up a sharp debate over just how much oxygen is present in mantle rocks—and, by extension, whether mantle-rock formations have an “oxidation state” low enough to allow methane to exist in significant quantities. “A balanced view would say that all these measurements show that the mantle is lumpy—it’s got some reduced [unoxidized] lumps and some oxidized lumps,” says David Eggler, a geochemist at Penn State University. Thus methane would predominate in some areas, carbon dioxide in others.

Gold agrees with this point of view. But he adds that even if the entire mantle were highly oxidized, large bubbles of methane would still survive their migration along cool paths. Some of the methane would react with oxygen to form carbon dioxide, but after a time all the oxygen available in rock surfaces along a given path would be used up. Hence large bubbles—the only kind that could build up the pressure necessary to fracture rocks and move upward—would remain intact.

In reality geologists know so little about the Earth’s depths that no one can prove or disprove any of these hypotheses. As Eggler explains, “There is still a tremendous

[illegible]

1983 84

1973

A collage of five black and white photographs showing dancers in various poses, likely from the 1930s. The images are arranged in a grid-like fashion. The top-left photo shows a dancer in a dynamic pose, possibly a dip or a lift. The top-right photo shows a dancer in a wide, horizontal pose, possibly a split leap or a wide stance. The bottom-left photo shows a dancer in a pose that looks like a controlled fall or a deep crouch. The bottom-center photo shows a group of dancers in a dark setting with bright spotlights. The bottom-right photo shows a dancer in a pose that looks like a controlled fall or a deep crouch, similar to the bottom-left photo.

Journal of Interpersonal Violence, 2006, Vol. 21, No. 9, pp. 1178–1190
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198] 83

A collage of six black and white photographs showing various scenes of destruction and aftermath. The top row features three images: a large, dark, heavily damaged structure; a close-up of a damaged wall with a bright light source; and a dark, possibly flooded or debris-filled area. The bottom row features three images: a damaged building with a large, dark, irregular opening; a bright, overexposed scene of a damaged structure; and a scene of a damaged building with a large, dark, irregular opening.

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1984 5

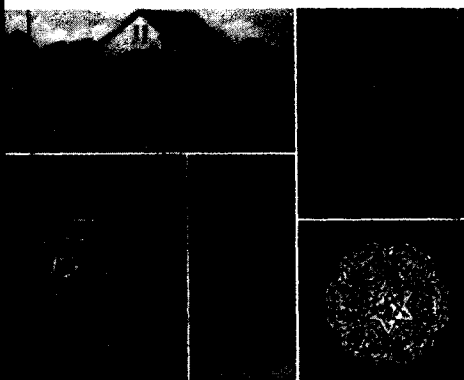
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1981 82

1977.

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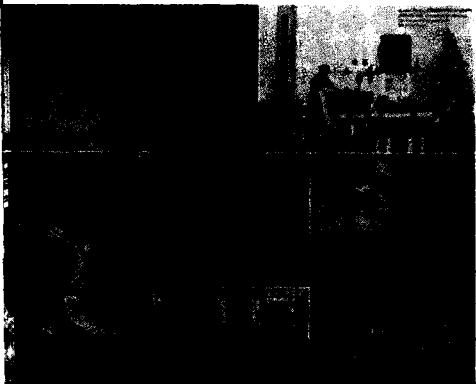


Muriel Gordon Conway, a self-taught fashion designer from the mid-20th century, was one of the most original and creative designers of her time. Her designs were characterized by their simplicity and elegance, and they were widely admired.

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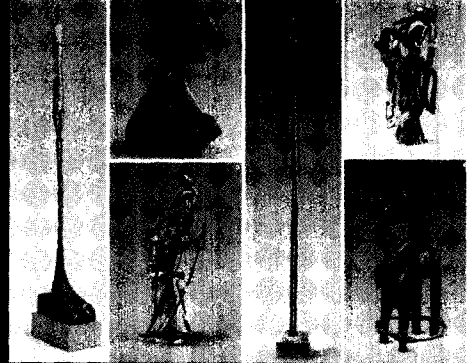


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amount we don't know about how fluids move in the mantle and crust."

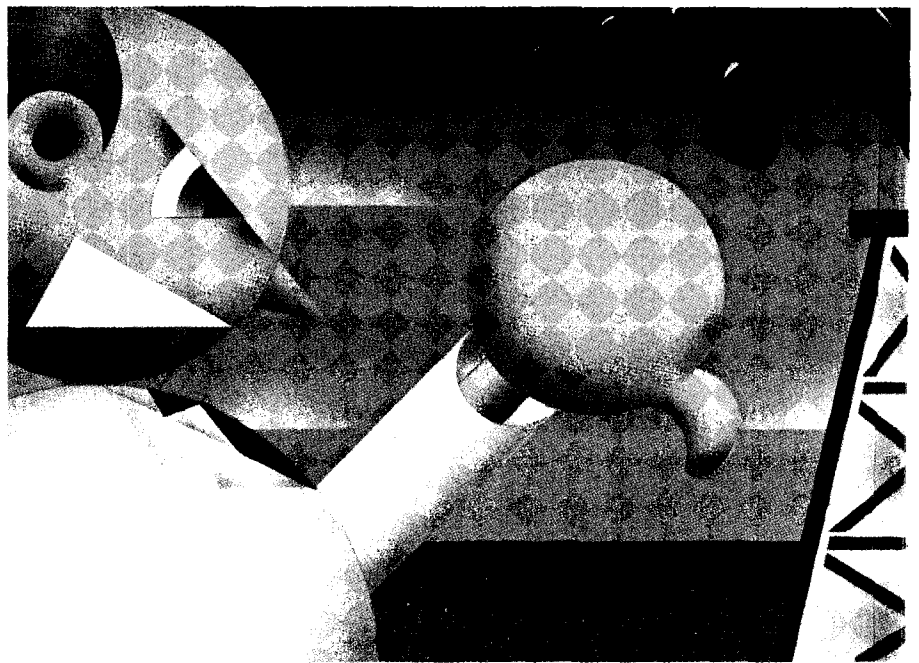
For proof of this statement, one need only look at the world's deepest hole, drilled by the Soviets in the granite shield of the Kola peninsula—north of the Arctic Circle but not far from the Siljan Ring. Granite is very dense. Except in areas stripped bare by glaciers, such as this one, it underlies thousands of feet of sediments. Thus by going past 40,000 feet, Soviet scientists are looking at what might normally be found at 50,000 to 60,000 feet: ten miles below the surface. To their surprise—and that of the international scientific community—they have found zones of suddenly increased porosity, in which liquids and gases (including methane) are circulating. This was thought to be impossible at a depth of even three miles in granite, because the weight of the overlying rock would crush all pore spaces. Soviet scientists also report the presence of sulfides that appear to have come from the mantle. The startling new data, said the Soviet newspaper *Izvestia*, "mean there is migration of saline solutions and gases at great depths. As a result, we will have to take a new look at . . . the origin of oil."

THE RUSSIAN DISCOVERY APPEARS TO prove at least one piece of Gold's theory. Petroleum geologists have long assumed that as depth increases, rock porosity decreases, until finally the weight of the overlying rock is so great that all pores are squeezed shut, leaving no room for oil or gas. When Robert Hefner and others began drilling below 15,000 feet, however, they found otherwise. They did encounter zones of almost no porosity, usually at 12,000 to 15,000 feet, but below them they found further zones of increased porosity, full of extremely compressed, "geopressed" gas. According to Paul Jones, a veteran of thirty-three years with the United States Geological Survey and an expert on the deep, pressurized gas under the Gulf Coast region, every oil-producing sedimentary basin in the world exhibits this pattern. Many geologists still describe geopressed zones as anomalies, caused by impermeable layers of rock overlying porous layers in sedimentary basins. But the discovery of the same pattern in granite, rather than the more porous sedimentary rock, challenges that conventional wisdom.

Gold had actually explained the phenomenon several years before the Soviet discovery. If gas or fluids accumulated beneath the impermeable zone, he reasoned, they would be under such enormous pressure that they would force open pore spaces in the rock. The overlying impermeable zone, which Gold calls the "critical layer," would seal in the gas until it built up so much pressure that it burst through. Gold reasoned that the Earth's depths

would consist of a series of critical layers and pressurized zones, each with higher pressure than the one above. If gas and oil were migrating upward, they would build up in each zone until the pressure was too great, whereupon they would burst into the next zone. The Soviet hole shows two distinct critical layers in granite—a great surprise to most geologists. The Soviets, like Gold, believe that the porosity exists because fluids under tremendous pressure have literally fractured the rock.

Gold's critical-layer theory may explain why deep-gas drillers over the past decade have hit such vast deposits. Regardless of whether the gas is migrating up from below or cooking out of the sediments, the first critical layer acts as a seal. "That means," Gold explains, "that you're going to find gas at that level, without any special cap rock. You see, in the upper domain to find gas you have to have a very good cap rock. And in what fraction do you have caps?



A tenth of a percent? A hundredth of a percent? So when you do away with the need for a cap rock, you're going to have a hundred or a thousand times more gas. That's why this critical-layer story is so important."

GEOLOGISTS KNOW A GREAT DEAL MORE ABOUT OIL and gas than they do about the Earth's depths. But even oil and gas contain their share of mysteries. Hollis Hedberg, who is referred to by some as the grand old man of American petroleum geology, wrote in 1964: "It is remarkable that in spite of its widespread occurrence, its great economic importance, and the immense amount of research devoted to it, there perhaps still remain more uncertainties concerning the origin of petroleum than that of any other commonly occurring natural substance."

The history of oil exploration, like that of most processes developed by trial and error, is a story of repeated

mistakes, wildly inaccurate predictions, and hopelessly inadequate theories. Every ten years or so since 1920 the experts have announced that the oil or gas reservoirs in the United States are about to run dry. Until 1932, when a major field was discovered in Bahrain, petroleum geologists said that no oil existed in Arabia. And before Robert Hefner proved them wrong, industry experts scoffed at the idea of gas below 20,000 feet.

Among petroleum geologists debate still rages over key issues: how kerogen is transformed into oil, how oil molecules migrate out of their source rocks, how oil migrates hundreds of miles to form reservoirs. The mysteries concerning gas are even greater. Until Congress deregulated gas, in 1978, price controls had discouraged exploration. Most of the world's gas had been found as a byproduct of the search for oil, and for years much of it had simply been burned off at the wellhead as a nuisance. Since few geolo-

would create distinct patterns on the surface of the Earth. In contrast, if methane was produced from biological sediments, there would be no particular reason for mercury or helium to collect in gas fields or to show large regional patterns.

Having thought this through, Gold began to look for evidence. He found that mercury is so abundant in some oil and gas regions that its detection at the surface was used for hydrocarbon prospecting. And helium is found so often with methane that gas wells are its principal commercial source.

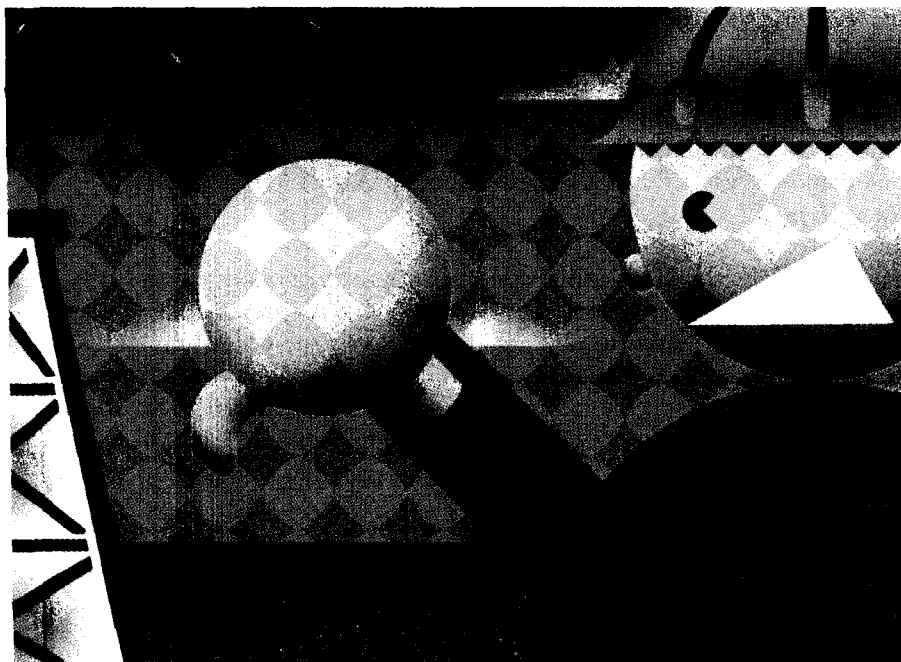
Welte and other petroleum geologists argue that methane reservoirs are simply good traps for helium. Gold counters by asking why methane would stop helium so much more efficiently than other gases do. Welte's explanation, he adds, would hardly account for large regional patterns in helium concentration. "In the United States,"

Gold maintains, "a connected region can be singled out as being particularly helium-rich, as observed in thousands of wells; it is the region stretching from the Panhandle of Oklahoma and Texas westward into New Mexico and Arizona, and then northward through Utah, Colorado, Wyoming, and at least as far as Montana. It is doubtful that one could find any feature of the chemical makeup of the sediments that would account for the presence of so much helium in this large connected region. . . . Presumably, this has to be attributed to a large-scale outgassing pattern from mantle depths."

Nitrogen, too, is found in many gas wells, in amounts that are very difficult to explain on the basis of surrounding sediments. In one area of the Texas Panhandle every well for a hundred miles shows nitrogen, helium, and methane. Scientists at the U.S. Bureau of Mines have measured the gases and found that their concentrations follow a definite pattern.

According to Gold, this pattern means that every well in the area had to be filled from two distinct sources: methane containing five percent nitrogen, and nitrogen containing 7.8 percent helium. Gold believes that this is dramatic evidence of a deep source. Such thorough mixing over a hundred miles, from two sources in sediments less than a mile deep, seems to him totally implausible. "The more likely explanation," he argues, "is that two source regions in the mantle, in independent locations, are each deep enough to have supplied the whole area."

Most petroleum geologists doubt that even one of the two sources originated very far below the sediments. But to make sense of the evidence they tend to argue that the nitrogen and helium may have come from deep sources but that the methane migrated from the nearby Anadarko Basin. Gold counters that the two gases are combined in such a precise and consistent ratio over a hundred miles that the mixing must have occurred well before the mix-



gists had looked for gas, few had studied just where and under what circumstances it occurred. Hence the glaring ignorance of its plenitude below 15,000 feet.

Gold's best evidence that deep methane is often nonbiological lies in the frequent presence of other gases, such as helium and mercury, in methane reservoirs. These gases are generally too thoroughly dispersed through the mantle and crust to form bubbles large enough to migrate. The sizable quantities that are found, Gold believes, must have been collected along a vast migration path by another, more abundant gas. Both mercury and helium would be quite volatile in hot, deep rocks; hence they would easily be absorbed by a migrating gas.

If abiogenic methane was filling reservoirs, then, it would often contain high concentrations of these "trace elements," as Gold calls them. Since the gas would be migrating up through faults and rift zones, the trace elements would be present primarily above those zones. Hence they

ture filled all the wells. Why would Anadarko gas sneak into every reservoir in precisely the same ratio to nitrogen and helium? he asks.

At the Oak Ridge conference some considered the Panhandle field phenomenon to be Gold's strongest piece of evidence. Since then, Gold says, he has examined Bureau of Mines data for other fields in Oklahoma, West Texas, and Kansas and found several other patches showing similar mixing from two distinct sources. One of these, in Kansas, stretches over 140 miles.

Gold also raises questions about trace elements in oil, principally nickel and vanadium. In many parts of the world these metals occur in large regional patterns. Along the west coast of South America, for example, most of the oil is very high in vanadium. Throughout Venezuela the ratio of nickel to vanadium is remarkably constant. The oils of the Persian Gulf, the Ural Mountains (in the USSR), and parts of West Africa each have constant ratios of nickel to vanadium as well. Gold believes that a deep origin is the only logical explanation for such precise patterns over hundreds of miles.

Gold's critics have said little publicly about his trace-element evidence. Their principal argument regarding methane has to do with the carbon-isotope patterns of methane, ethane, and propane found in gas wells. Most carbon atoms are "carbon-12 isotopes"—that is, they have twelve nuclear particles (protons and neutrons)—while a few are "carbon-13 isotopes," with thirteen. An unusual proportion of carbon-13 isotopes can tell scientists much about the history of the material in which the isotopes are found. Most gas tested exhibits carbon-isotope patterns indicating that the methane was produced when more complex molecules cracked apart—as methane *is* produced, according to the conventional view.

For Gold, the central question is whether oil molecules could survive at great depths and high temperatures and pressures. If so, they might break apart as they rose and the pressure dropped, leaving gas molecules with the isotopic patterns typically observed in biogenic gas. Gold cites calculations published in 1980 by a Soviet scientist, E. B. Chekaliuk, suggesting that most oil molecules would be stable down to 300 kilometers (almost 200 miles), because of the enormous pressures at such depths. Gold, who calls this a "radical reinterpretation" of the conditions necessary for oil to retain its molecular structure, is working to test the calculations. So far his laboratory has proved that at 300 degrees centigrade and one kilobar of pressure, oil molecules not only are stable but also can incorporate additional carbon atoms from methane molecules. At temperatures thought to trigger a rapid breakdown of oil, high pressures allow the reverse process. The Cornell results will be published soon.

The Gas Research Institute is funding this research and work in another laboratory on the stability of methane at high temperatures and pressures. It has also signed contracts for research on mercury in gas and on nickel and vanadium in oil. But its most productive effort, outside the

Siljan Ring, has come in California's Sacramento Basin. There Global Geochemistry Corporation, of Canoga Park, California, is examining trace elements and carbon-isotope ratios in a series of gas fields. In several fields researchers have found high levels of the helium-3 isotope, which scientists agree must have originated in the mantle. They have also discovered enormous amounts of nitrogen—so much that it too appears to have migrated from the mantle. They have found fields in which ethane is isotopically lighter than methane—the opposite of what could be expected from biological processes. And they have found methane with carbon-isotope values similar to those found in the East Pacific Rise, which suggests abiogenic origins.

Peter Jenden, who manages the GRI contract at Global Geochemistry, stresses that alternative explanations exist for all of these phenomena. "I'm not going to commit myself and say this is abiogenic gas," he says. "But some very unexpected things are going on. We feel that deep-source methane may have migrated into the basin. We have faults, we have igneous activity [earlier intrusions of hot magma from the mantle], and we have a lot of tectonic activity [faulting and folding] in relatively recent geological time. All of these activities could give rise to the release of gases derived from the upper mantle."

ALTHOUGH MOST PETROLEUM GEOLOGISTS REMAIN adamant that Gold's theory is specious, some acknowledge that when the debate centers on methane, they lack the ammunition to shoot him down. James Stinnett, a geochemist from Mobil, who presented the carbon-isotope evidence at Oak Ridge, is one. "If he had confined himself to gas," Stinnett admitted at Oak Ridge, "it would be difficult to prove him wrong."

When the subject is oil, however, the situation is reversed. Most petroleum geologists believe that they have indisputable proof that every oil field that has been tested is of biological origin.

Over the years, petroleum geology has offered a number of "proofs" that all oil is biological. Many had to do with the presence in oil of substances thought to come only from plants and animals. But in recent years all of these substances have been discovered in meteorites, have been created nonbiologically in laboratories, or have been traced to bacteria feeding on oil—suggesting that they could exist in nonbiological oil as well.

Another argument focuses on source rocks. Many petroleum geologists contend that oil is found near *every* potential source rock that has been hot enough to produce it from biological sediments but is *never* found near source rocks that have not been hot enough. If the oil were nonbiological—and thus did not need to cook—there would be no reason for this relationship. But the facts are debatable, even among petroleum geologists. The case is also weakened by the awkward reality that no source rocks have ever been found for some oil and gas (for example, in much of the Gulf Coast). Most petroleum geologists argue

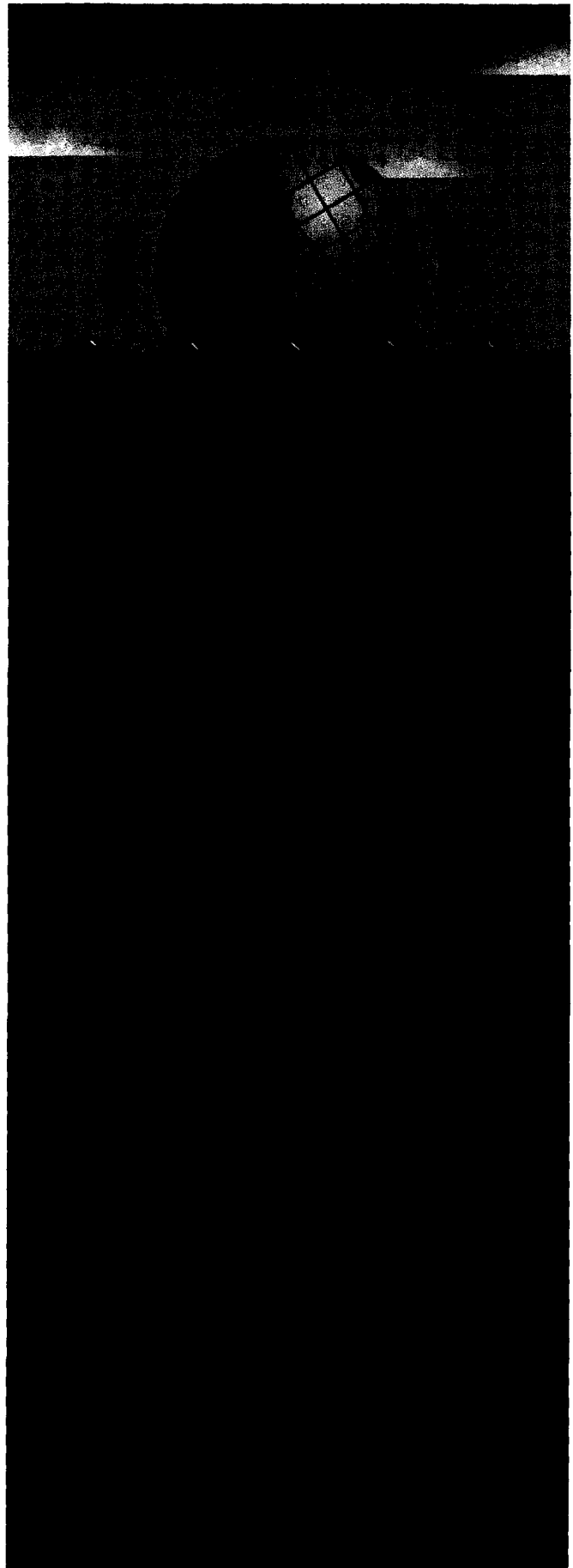
that the rocks are simply too deep to locate with current drilling equipment. Gold suggests that they do not exist. Whatever the reality, the absence of source rocks makes them hard to use as proof of anything.

For absolute proof, petroleum geologists rely on one powerful argument. By pressure-cooking chunks of source rock, they explain, they have been able to produce virtual carbon copies of the oil found in nearby reservoirs—proving beyond a shadow of a doubt, to their minds, that the oil in question came from biological kerogen in the source rock.

Unlike methane, oil is not one compound but hundreds. The variation lies in the number of hydrogen and carbon atoms bonded together: the more atoms, the heavier the oil. At last count, some 600 different structures ($C_{20}H_{42}$, $C_{40}H_{82}$, and so forth) had been found. In a laboratory, scientists can easily measure the proportion of each different kind of molecule in any given oil sample. They can then cook oil out of the nearby source rock and compare the two samples. The cooking process, known as hydrous pyrolysis, goes like this: chunks of shale, the most common source rock, are cleaned with solvents to extract any oil already present and then heated in water to high temperatures. Over a period of days oil is produced. Eventually that oil will have the same proportion of each different hydrocarbon molecule that the oil in the associated reservoir has—proving, to the petroleum geologists, that the reservoir oil came from the source rock. According to John C. Winters, an Amoco geochemist, his laboratory has also used strong acids to dissolve away all the rock, leaving only organic matter, or kerogen. The cooking process has then been repeated, with the same results.

From Gold's perspective, such experiments are tautological. If hydrocarbons are streaming up from below, they will not only fill reservoirs under cap rocks but also stream through shales. "If you have a fairly dense shale," Gold explains, "it is quite likely to become the main condensing material in which heavier hydrocarbons carried up by the methane would be arrested and get stuck. It's just a very fine filter. I suspect that very much of the oil shale in the world is just that." Thus hydrous pyrolysis may show nothing more than that one source filled both the shale and the associated reservoir. As for the experiments with kerogen, Gold notes that they have not been published and that he has not had a chance to examine them. But he points out that kerogen itself can apparently be produced nonbiologically, since some forty kerogen-like substances have been identified in meteorites.

If the petroleum geologists can provide independent proof that the kerogen they're testing is of biological origin, and if this process of hydrous pyrolysis can be repeated successfully on any source rock, however, Gold's case for nonbiological oil is weakened. If such proof is ever forthcoming, Gold says, he will have to fall back to what he calls his "minimal position": that the presence of nonbiological methane enhances the production of biological oil.



This might occur in several ways. Methane might consume most of the oxygen present in the rocks (by reacting with the oxygen to form carbon dioxide and water) and thus create the relatively oxygen-free environment needed to form oil. At high temperatures methane might release free hydrogen, which would migrate upward and react with biological kerogen to produce more oil. Or methane might help the larger oil molecules get out of the source rock, by building up enough pressure to create small fractures in the rock, through which oil could flow. Hollis Hedberg, seeking to explain how large oil molecules migrate out of tightly compressed rocks, has suggested that *biological* methane may do just this.

Gold calls this his minimal position because in his view it is the slightest adjustment possible in the conventional theory if one is to account for the evidence he has gathered. He says, "This would be the only way you could hold onto the conventional view and still understand why so many of the giant fields are in the Middle East; why gas and oil fields are vertically stacked in the same location, but in rocks from different geological epochs; why we have distinct lines on the surface of the Earth, along geological formations such as plate boundaries, that are particularly hydrocarbon rich; and why we have so much helium, mercury, vanadium, and nickel in our oil and gas." If this minimal position proves out, of course, it would still mean that vast quantities of nonbiological methane existed on Earth, in reservoirs that might still be filling up.

A MONTH AFTER GOLD FIRST DEFINED THIS MINIMAL position, in the wake of the Oak Ridge conference, a revolutionary discovery published in *Nature* suggested a new and intriguing link between abiogenic methane and biogenic oil. John Baross, a microbiologist from Oregon State University, and Jody Deming, from Johns Hopkins University, announced that they had found primitive bacteria in the super-hot vents of the East Pacific Rise. When tested, the bacteria continued to multiply rapidly up to 250 degrees centigrade, as long as the water was under enough pressure to prevent boiling. Scientists had previously known of only one micro-organism that could survive above the boiling point. The results of Baross and Deming's experiment have been challenged, in part on the theory that the bacteria may have come from contamination of the seawater by a source unrelated to the East Pacific Rise. But Baross says that he has found the same bacteria in all other hot ocean vents he has sampled, at temperatures above the normal boiling point. Though equipment to duplicate the test at the highest temperatures is still under construction (the initial experiment was done in a borrowed lab), Baross says that he has duplicated it up to 120 degrees centigrade and has submitted a paper on the results. If his experiments are accurate, they would suggest that deep underground, where pressures are higher, these bacteria could thrive under even hotter conditions.

Baross and Deming's results would force a re-evaluation of many scientific questions—the possibility of life on Venus, with its high atmospheric pressures and temperatures; the process by which life sprang from nonliving matter here on Earth; and, of course, what goes on in the Earth's crust. "It would mean a lot of potential activity by bacteria in the crust, which would force us to rethink a lot of our assumptions," Baross says.

The primitive bacteria discovered by Baross and Deming multiply a hundredfold in a few hours. Unlike most organisms, they do not draw their energy—either directly, by photosynthesis, or indirectly—from sunlight. Instead, they are fed by energy from reactions involving inorganic chemicals, such as sulfur and iron. Gold notes that other bacteria may exist whose source of energy is the oxidation of methane streaming up from the mantle. Bacteria feeding on this energy would constitute an enormous reservoir of organic material capable of being transformed into kerogen and oil, just as other plant and bacterial life is transformed. That oil would be biological, but the original source of energy would be nonbiological methane, rather than photosynthesis.

Baross and others have also found micro-organisms that produce methane at temperatures near boiling, at surface pressures. Today microbial methane is thought to exist only in shallow sediments, because microbes capable of producing methane were not known to survive above 80 degrees centigrade. Baross hopes to test the new organisms under high pressure. If they continue to produce methane at temperatures and pressures found deep underground, he will have found yet another potential source of hydrocarbons independent of photosynthesis.

BAROSS AND DEMING'S FINDINGS ARE NOT ALONE IN being rejected by skeptical scientists. Soviet data are rejected out of hand by many of Gold's critics, despite the fact that scientists who have worked with the Russians, such as Michel Halbouty, describe them as cautious and reliable. The dispute is critical, because Soviet geologists have done so much of the research to support the abiogenic theory. For instance, Soviet scientists report enormous quantities of methane hydrate—methane-saturated ice in cold ocean sediments and Arctic permafrost—on their side of the Arctic. To Gold, this hydrate is so prevalent that it must be abiogenic, in which case vast supplies of methane are probably trapped under it. On the American side of the Arctic, however, methane hydrate appears to be far less common. Some of Gold's critics deal with the anomaly by disregarding the Soviet data.

The debate over Gold's hypothesis also suffers because it ranges over so many fields, from the formation of the planets to the makeup of the mantle, from earthquake theory to the study of meteorites. No one scientist can claim expertise in all these areas. As a result, Gold's opponents tend to ignore his evidence in areas with which they are unfamiliar—falling back time and again on their conven-

tional proofs. Gold, not well versed in many of the details of petroleum geology, often does the same.

The problem is intensified by Gold's passion for sweeping statements, his impatience with details. "Gold is a genius, and we don't expect geniuses to bother with details," says Ed Schmidt, a former nuclear engineer and high-level NASA scientist who knows him well. But because Gold is occasionally wrong about details, he infuriates the petroleum geologists. The fact that someone whose knowledge of their field is spotty would tell them that their entire careers have been built on a fallacy sends them into a rage.

At Oak Ridge anger lurked constantly beneath the surface, erupting into frequent arguments and one nasty confrontation. John C. Winters, of Amoco, later told a reporter that he would never again share a platform with Gold, because Gold was "out of the realm of rational science." Alvin Weinberg, at that time the director of the host Institute for Energy Analysis and the moderator of the conference, said in summation, "I've never been at a meeting quite of this character, where the lines have been so sharply drawn and the emotions so deeply held. And you must remember, I've twice sponsored conferences on the future of nuclear energy."

Gold has called into question an entire theoretical edifice, constructed of beliefs so interwoven and fused that they cannot be altered piece by piece but must either stand the test as a whole or come tumbling down. Petroleum geologists have too much invested in this edifice—and too little faith in Gold's hypothesis—to give up without a fight. Gold is equally unwilling to yield. Gregg Marland, who organized the Oak Ridge conference, characterized the debate perfectly when he called it religious: nothing one side could say would change the other's view.

This is nothing new in science. Thomas Kuhn, in *The Structure of Scientific Revolutions*, described the difficulty scientists have in abandoning an entire world view when new evidence arises:

Copernicanism made few converts for almost a century after Copernicus' death. Newton's work was not generally accepted, particularly on the Continent, for more than half a century after the *Principia* appeared. Priestley never accepted the oxygen theory, nor Lord Kelvin the electromagnetic theory, and so on. The difficulties of conversion have often been noted by scientists themselves. Darwin, in a particularly perceptive passage at the end of his *Origin of Species*, wrote: "Although I am fully convinced of the truth of the views given in this volume . . . , I by no means expect to convince experienced naturalists whose minds are stocked with a multitude of facts all viewed, during a long course of years, from a point of view directly opposite to mine. . . . But I look with confidence to the future—to young and rising naturalists, who will be able to view both sides of the questions with impartiality."

Kuhn's crowning comment is provided by Max Planck, who,

surveying his own career in his *Scientific Autobiography*, sadly remarked that "a new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."

While Gold's theory may not be proved or disproved to everyone's satisfaction for decades, the clash of views and collision of disciplines does have one profound benefit. It shakes up assumptions that have too long gone untested, forcing scientists to confront evidence developed in other disciplines that challenges the conventional wisdom in their own. Often such a collision is needed to disprove theories that have predetermined the development of entire fields for decades. Suddenly new avenues of research open up, and science makes great strides in a hurry.

"The story is really how science progresses," says John Baross, who is now at the University of Washington. "Somebody has to come up with a hypothesis that is a major leap forward. But between that leap and what is now believed, there is almost no data. So you either take it in the ear for years, or you take it in the ear until you die. Gold is very much like Wegener. I lecture about this in the classes I teach, and I always use Tommy Gold as an example. He has already had a very positive impact, whether he's right or wrong."

THE ONE HOPE OF A DEFINITIVE ANSWER REMAINS the Siljan Ring. Gold's thoughts first turned to meteoric-impact structures because their fractured depths, he realized, might provide migration routes for hydrocarbons originating in the mantle. Then he received a paper from Richard Donofrio, a petroleum geologist with expertise on the subject. Donofrio believes that impact structures may provide "absolutely massive" reservoirs. Calculating the porosity and permeability of basement craters in the Canadian Shield, he concludes that a crater twenty kilometers wide could hold more than the total recoverable reserves of the entire Middle East.

Gold was already familiar with the Siljan Ring. He knew that one could find tarry oil in the cracks of its granite outcroppings. Since the sediments around the edge of the ring are shallow, 1,000 feet at their deepest, he doubted that they could create all the seeps. Then the Swedes found abnormal quantities of radon streaming out of the granite. A radioactive product of the decay of uranium, radon has a half-life of only four days; hence very little of it survives long enough to percolate out of the ground on its own, without some carrier gas. If the carrier gas were methane, Gold reasoned, it would leave behind a characteristic piece of evidence: isotopically light carbonate rocks. And sure enough, when Gold had rocks from the area analyzed, he found just such a carbonate. By his calculations, at least 10 trillion cubic feet of gas—and probably much more—would have had to stream through the area to lay down the amount of light carbonate found. Ten

trillion cubic feet is more than half the annual consumption of natural gas in the United States.

Other scientists dispute Gold on this point. According to Fred Vlierboom, an Occidental Petroleum geochemist who analyzed some of the Siljan Ring data for the Swedes, similar light carbonates are found throughout Sweden's granite shield. Though he has no idea how they got so isotopically light, Vlierboom doubts that methane could be streaming through the entire country; only in the Siljan Ring did a meteorite fracture the granite, creating routes for migration.

More powerful evidence in favor of Gold's theory has come from seven test wells sunk by the Swedes. All revealed traces of methane and hydrogen, and in one, drilled through about 600 feet of sediments into the granite beneath, methane was found at more than 1,500 feet—more methane than was detected in any of the other, shallower, wells. Vlierboom questions both the amount of methane detected and the depth at which it originated, because of the methodology used to measure the gas. But if any methane was found in granite, 900 feet below the nearest possible source rocks, Gold and others would view it as a powerful indication that gas is migrating up from the depths.

The Swedes have run gravity surveys and seismic tests, both of which suggest significant porosity within the pulverized granite. The seismic studies appear to show a series of layers that could act as cap rocks. William Duchscherer analyzed samples from the area; he is a specialist in the use of a prospecting technique that involves searching for a "halo" distribution of abnormal carbonate rocks and trace metals—a halo that he believes is created by hydrocarbons spilling over the edges of a cap rock, oxidizing on the way up, and laying down the carbonates.

The Siljan Ring "is one of the best prospects I've seen," Duchscherer says. "We've surveyed over ninety million acres all over the Earth, and it really stands out, because of the quality of the halo. Obviously, methane or similar gases have been leaking there for years. A reservoir has to be under there somewhere."

Halbouty agrees that the halo is suggestive; Vlierboom does not. Some geologists think that oil from the shallow sediments could have laid down the carbonates; Vlierboom disagrees with this, too, but scoffs at the idea that methane migrating from the depths could have done so.

Tom Russell, a geophysicist whose firm, Tarex, Inc., analyzed the seismic data from Sweden, exhibits the contradictory nature of the industry's response. On the one hand, he cannot believe that abiogenic gas exists in significant quantities; hence he considers the Siljan Ring "a hell of a long shot; I think it's a one in a million possibility." On the other hand, the seismic studies indicate the existence of a cap rock or trap. "It's almost indisputable," Russell says. "If this were in the oil patch, I'd sell the farm."

For Russell, as for others, the bottom line seems to be this: "If abiogenic-gas generation is a real possibility, this is the place to drill." Henry Linden, whose Gas Research

Institute plans to invest up to \$4 million in the well, calls it "the definitive experiment." If the drill hits deep oil or gas in large enough quantities, no sediments can explain it. "If it produces a field of giant proportions," Gold says, "it'll be all over."

In reality, of course, persuading the industry to embrace Gold's theory would not be that easy. Though many petroleum geologists seem ready to swallow their skepticism if the Swedes strike it rich, some would undoubtedly come up with an alternative explanation—perhaps sediments subducted under the granite shield or driven deep into the rock by the impact of the meteorite.

Other deep-drilling programs may also provide evidence. The West Germans are launching a research effort similar to the Soviets', and a new group in the United States, funded by the National Science Foundation and the U.S. Geological Survey, hopes to do likewise. Donofrio's firm, Astro Geological Resources, Inc., has already drilled to 10,000 feet in Mississippi, seeking to penetrate another ancient impact structure, buried in basement rock beneath thick sediments. If he can raise the money to continue, Donofrio says, the well could be "the U.S. equivalent of the Swedish deep-earth-gas project. We are getting a geochemical halo, and if we do get something down there, the probability is that it's abiogenic."

ONE THING IS CERTAIN: GEOLOGISTS WILL CONTINUE to explore new frontiers. Some may be nudged by new evidence turned up in the debate over Gold's hypothesis, others enticed by Gold's ideas themselves.

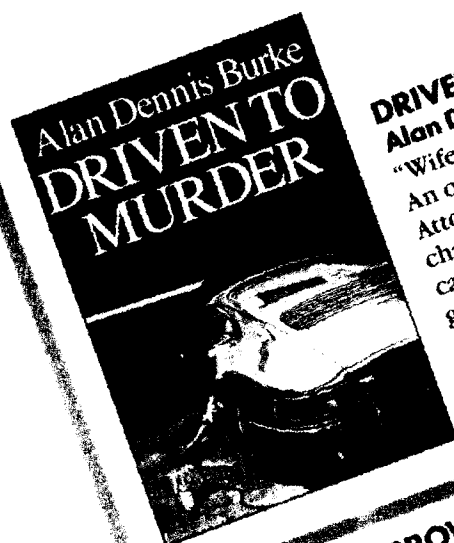
In 1952 a distinguished geologist named Wallace Pratt published a paper, in the *Bulletin of the American Association of Petroleum Geologists*, about what he considered to be the single most important ingredient in the search for oil and gas. Pratt reasoned this way:

The record demonstrates that, as oil-finders, we have persistently underestimated the amount of oil and gas that have been stored up in the earth's crust. We have been too conservative always. Despite all our mistakes, however, we have already found in the United States far more oil than our knowledge of the occurrence of oil permitted us to anticipate. . . . The conservatism of the trained scientist was nullified by the action of the untrained oil-finder, unhampered by "a little learning." If one man said there is no oil in Arabia (or West Texas), another man promptly drilled a well there to see—and often he found oil.

Where oil is first found, in the final analysis, is in the minds of men. When no man any longer believes more oil is left to be found, no more oil fields will be discovered, but so long as a single oil-finder remains with a mental vision of a new oil field to cherish, along with the freedom and incentive to explore, just so long new oil fields may continue to be discovered.

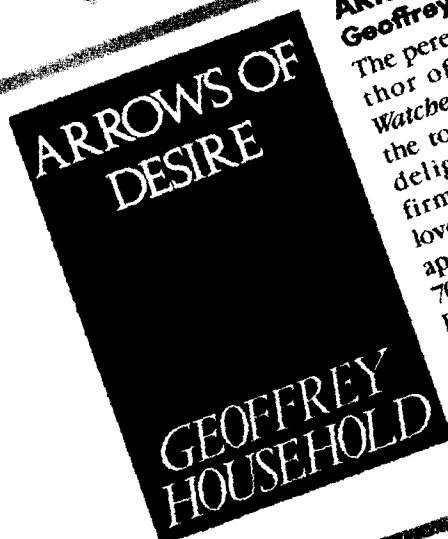
Vision, it is fair to say, is not Thomas Gold's short suit. □

A QUARTET OF QUALITY FICTION FROM THE ATLANTIC MONTHLY PRESS



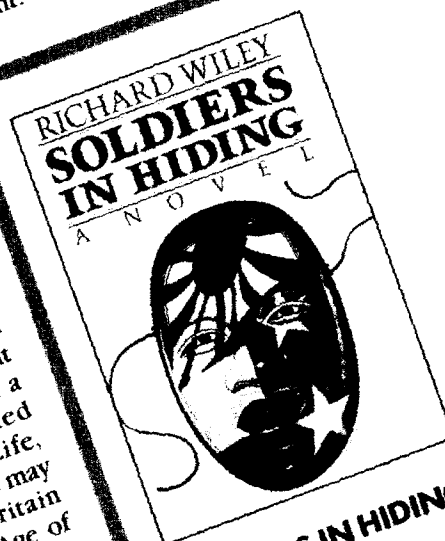
DRIVEN TO MURDER **Alan Dennis Burke**

"Wife shoots husband and confesses crime."
An open-and-shut case until the Assistant District Attorney uncovers a web of corruption and intrigue that changes the scenario—and threatens his own life. *Newsweek* called Burke's last mystery, *Getting Away with Murder*, "intelligent, goggled-eyed excitement."
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The perennially popular author of *Rogue Male* and *Watcher in the Shadows* is at the top of his form with a delightful fantasy fixed firmly in the future. Life, love and national crisis may appear different in Britain 700 years after The Age of Destruction. But what saves the day, not surprisingly, is old-fashioned English common sense.
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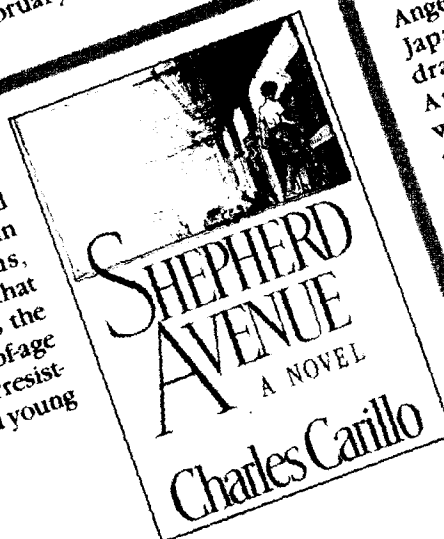


SOLDIERS IN HIDING **Richard Wiley**

This is a first novel of remarkable depth and daring—the story of two young Japanese-Americans, jazz musicians from Los Angeles, who are stranded in Japan after Pearl Harbor, drafted into the Japanese Army, and haunted by a war in which they could not choose sides.
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SHEPHERD AVENUE **Charles Carillo**

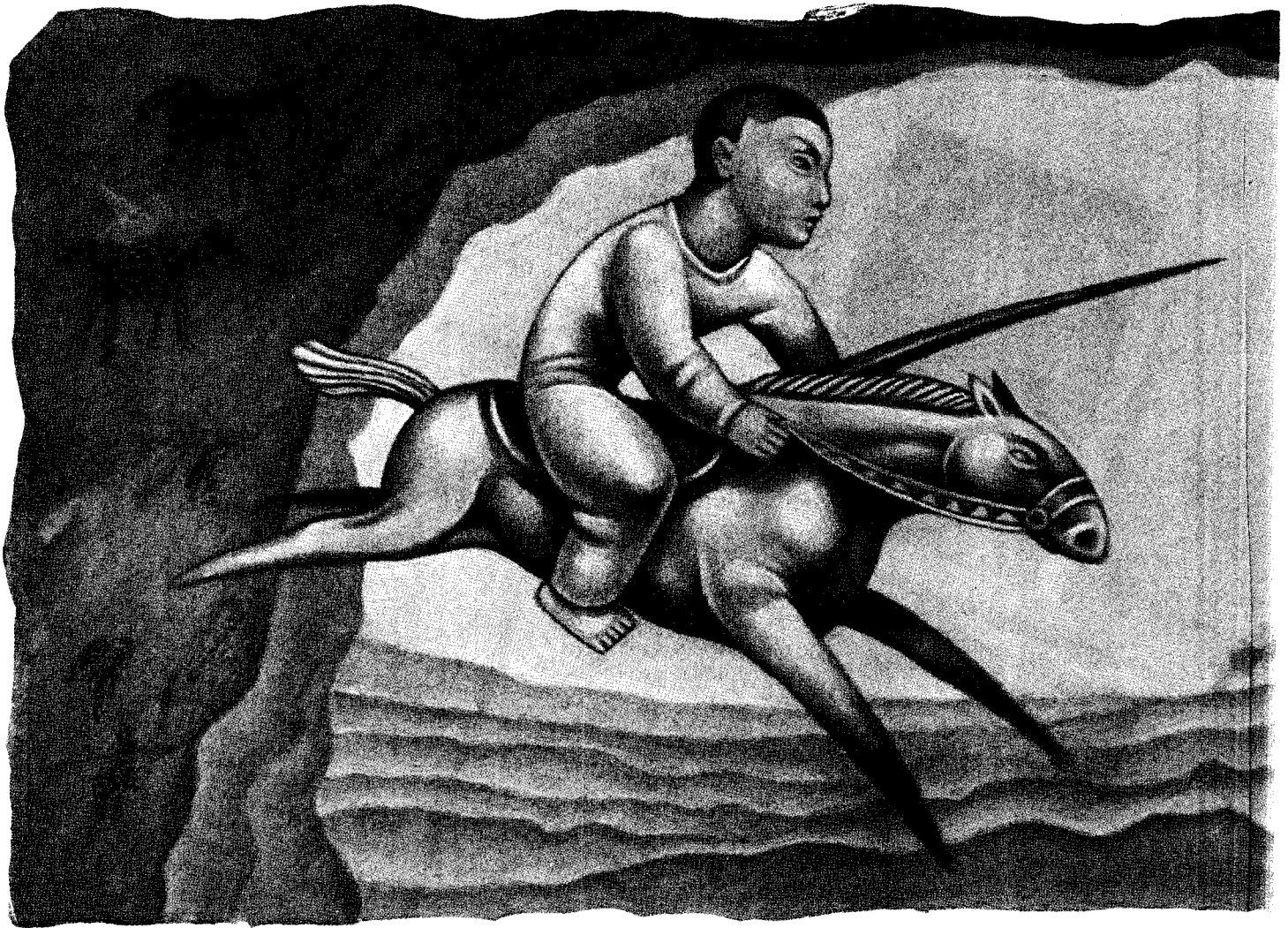
Shy, sheltered and motherless, ten-year-old Joey is packed off to his grandparents in Italian East New York—a boisterous, street-wise, matriarchal community that both nurtures and terrifies him. It is the beginning of a very special coming-of-age story—and the poignant, funny, irresistible debut of an impressively gifted young novelist.
March • \$15.95



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A Short Story



THE BLOODSONG

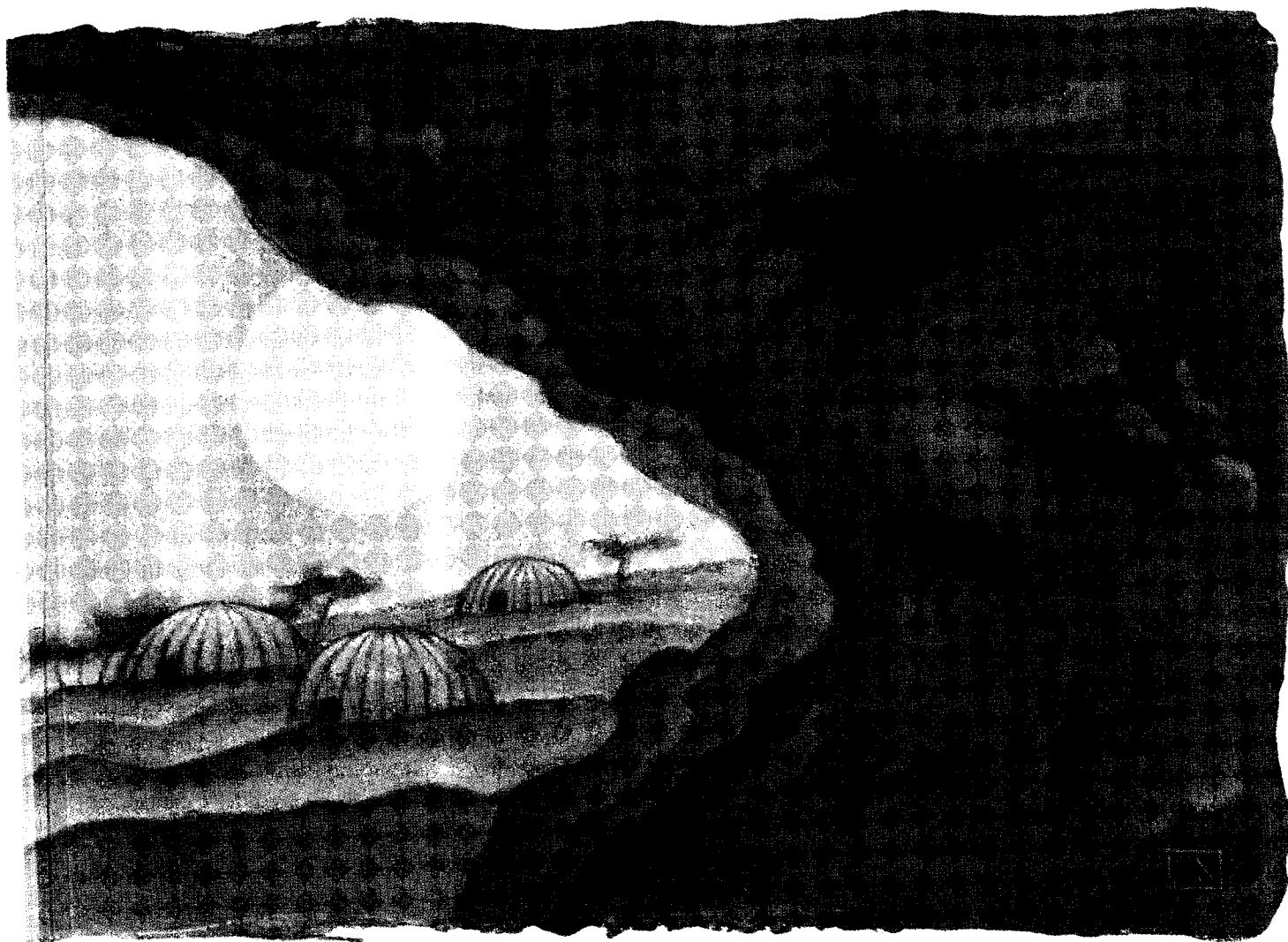
BY ERNST HAVEMANN

THE PATH OF THE ANCIENTS STARTED SOMEWHERE on the tableland, where the clan chief, Insimbi, had his kraal, and it ran through the valley to the east hills, where many of the clansmen lived.

Our farm was part of the white settlement that lay in the valley dividing the clan's land. Natives crossing from one side to the other usually went by government road, but occasionally someone would use the Path of the Ancients. If my father saw him, or her, he would scold, pointing crossly to the sign NO TRESPASSERS. NO RIGHT OF WAY. He had had it translated into Zulu, but since the trespassers could not read, this made little difference, except that the place where the sign stood came to be called the Place of Scolding.

Sometimes a man, though more often an obstinate old woman, would insist on proceeding. My father fumed but did not otherwise interfere. "I suppose they have a right-of-way by immemorial usage," he said, in extenuation of his weakness. The path was not in fact immemorial. All members of the clan knew exactly when it had been established. It had come into use nine generations ago, when Duma of the Battleaxe had led the clan's ancestors down from the mountains to occupy this piece of thornveld. Every man, and almost every boy, could recite his own pedigree step by step back to Duma or one of his band. When you wanted to thank someone, or show respect, you called him Duma or Child of Duma.

I knew about the Path and Duma and Insimbi because



Ngumbane, the foreman, was my friend. When things had gone wrong with my birth, Ngumbane had run fifteen miles to fetch a doctor. The doctor arrived too late to save my mother, and the desperate run left Ngumbane with a permanent limp. My father gave him a Friesian cow in recompense. The affair also left Ngumbane with a permanent stake in my development. As soon as I could toddle, he began taking me on his rounds with him. He talked to me about animals and insects, the clan's history, farm activities, and the private lives of the farm laborers. For a long time I was more fluent in Zulu than in English, but when I learned to read I would translate bits of the newspapers to him. My father was happy about the relationship. He knew I was in safe and affectionate hands, and that left him free to go away on his hunting trips.

When I was fifteen, my father went off on an extended trip during my school holidays. I stayed on the farm, as usual. One Saturday afternoon, shortly before work stopped, Ngumbane said, "Nkosane, there is something we must talk about." When no other people were present, Ngumbane called me "my little boy" or Child of Duma or perhaps by a fanciful praise-name describing my alleged feats or character traits: Mastiff That Breaks the Dog Chain, Exterminator of Locusts, Shield That Protects

Ngumbane From Wrath. Addressing me respectfully as Nkosane (which means "Little Chief") signaled something weighty. I sat down, to show I recognized that he wanted a serious discussion.

"Nkosane," he said, "you know that the Paramount Chief, whom we call the Lion, the chief of all our nation, comes next month to visit Insimbi. All the clans around here will meet to give him a royal greeting." I knew, of course; it was a major topic of local news.

Ngumbane went on, "There will be war dances, as in the old days. But the young men do not know all the dances. They have never performed together in regiments, only in little bands. So there will be a gathering tomorrow at Insimbi's place for them to practice together. They do not want to be clumsy when they greet the Lion. Many will come from over there." He pointed to the east hills and paused, as if the implication were clear.

I said, "I am listening, my father."

He resumed, patiently. "Exterminator of Locusts, those people who live over there must cross the valley to get to Insimbi's place. They say that because it is for the honor of the Lion, they will use the Path of the Ancients, as in the old days, before there were white farms here."

I said, "That does not matter. I will give permission to all who ask."

Ngumbane looked at his feet. "They will not ask, Johnny. Some of the older men may think they should, but not the young ones. The youngsters say this day will be as in the days of our grandfathers, when the clan could pass freely over their own land. They are full of insolence."

"What do you want me to do?" I asked.

"Why do you not go and visit the white village tonight?" he suggested. "If you are not here, the people will cross over tomorrow morning and return tomorrow night. If you are not here, their offense will not be seen, and there will be no trouble."

I had no intention of going to spend a boring Sunday in the village. "The people will be on the Path," I said. "I

shall stay here at the house. They will not see me, and so they will not be uncomfortable, and I will pretend not to know that they are there. After all, one cannot see the Path from the house."

Ngumbane sighed and then nodded reluctantly. "That will be good. Stay well, Johnny." He went off to join the laborers, who had already lined up, ready to leave for the African reserve where they had their homes.

I always enjoyed Sundays alone on the farm. On weekdays the dawn was full of the noises of oxen and mule teams, carts creaking and drivers shouting. On Sundays, in the quiet, one could hear successive waves of chirps and singing from awakening birds and other small creatures. But this Sunday morning the bird sounds were overlaid by something else—a pervasive hum, like that of large, distant beehives. I could see nothing around the house, so I took binoculars and climbed a tall lookout tree that gave a view across the farmlands to the river and the hills.

The Path of the Ancients, hardly noticeable in the normal course of events, was now thronged with an almost unbroken line of people: men carrying oxhide shields and fighting sticks and capped with widow-bird and ostrich plumes, and parties of women and girls in beads and ocher, carrying beer pots and food trays on their heads. All the way to the east hills little tributary trails fed more people into the thickening stream on the Path itself.

I had never seen such a sight. It would, of course, be even more spectacular when they and scores of other streams of people met at Insimbi's kraal. Why shouldn't I go there and see?

I quickly saddled a horse. I thought of wearing my riding breeches but decided against it: they would make me look like an official. Better to go in ordinary khaki pants. I stuffed some sandwiches into one saddlebag, and a few sticks of tobacco and boxes of matches into the other, for use as gifts. My eye fell on a large gray pebble; I added it, to throw on the cairn that flanked the Path. I set off along the farm road, which ran from the farmhouse over a little ridge. Beyond the ridge it briefly joined the Path.

The Path itself, usually no more than an overgrown track obliterated in parts by plowing, was now sharply defined by the passage of many feet. It meandered to avoid obstacles that no longer existed, curved wide round a marsh long since drained, and twisted between circular patches marking places where trees had once stood.

The marchers resolutely followed the Path's original route, never taking a shortcut, even where there was a stretch of farm road, nor deviating, even where the Path ran across a plowed field or sown pasture.

I waited for a break in the line. Several times people obligingly stopped, saying, "So you're coming with us," but I waved them on, because I knew the horse would be an embarrassment in the middle of a group. Some marchers greeted me, or saluted, or remarked on the horse. Twice a woman called, "Ha, Sea-eyes!" whereupon her companions all looked at me, saying, "Truly, eyes like the sea." Blue eyes never failed to amaze the Zulus.

UNDER THE VULTURE-TREE

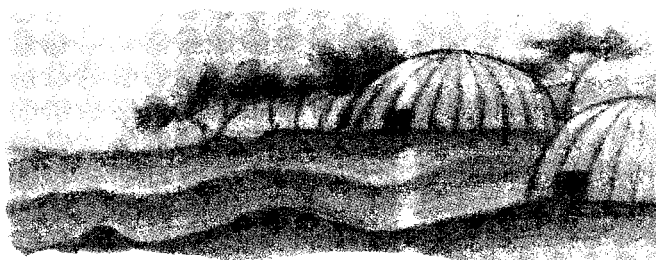
for Mary Oliver

We have all seen them circling pastures,
have looked up from the mouth of a barn, a pine clearing,
the fences of our own back yards, and have stood
amazed by the one slow wing beat, the endless dihedral drift.
But I had never seen so many so close,
hundreds, every limb of the dead oak feathered black,

and I cut the engine, let the river grab the boat
and pull it toward the tree.
The black leaves shined, the pale fruit blossomed
red, ugly as a human heart.
Then, as I passed under their dream, I saw for the first time
its soft countenance, the raw fleshy jowls
wrinkled and generous, like the faces
of the very old who have learned to empathize
with everything.

And I drifted away from them, slow, on the pull of the river,
reluctant, looking back at their roost,
calling them what I'd never called them, what they are,
those dwarfed transfiguring angels,
who flock to the side of the poisoned fox, the mud turtle
crushed on the shoulder of the road,
who pray over the leaf-graves of the anonymous lost,
with mercy enough to consume us all and give us wings.

—David Bottoms



THE PARTIES OF OLDER MEN MARCHED STOLIDLY, merely muttering a repetitive song phrase to keep time—"The strength of the antbear," "The bees of the mountain," "Kindle fire, my lads, kindle fire." The young men sang more-elaborate part-songs or solemnly recited an old war song: "Shame on the man who is burned in his hut. Come out and fight."

Eventually a break in the line allowed me to get onto the Path. I intended to leave it farther on, where it diverged from the straighter farm road, but when I made to turn off, the man ahead of me put out his arm to stop the horse. "That is not the way," he said reprovingly. When we reached the NO TRESPASSERS sign at the Place of Scolding, a number of people turned around and looked at me, smiling, but no one said anything.

The line halted when we reached the stone cairn. It is very bad to pass one of these cairns without adding another stone to it; consequently, all stones for hundreds of yards around had been picked up. Prudent people avoided bad luck by bringing small stones with them if they were to pass this way. Most of the people ahead of me had remembered to bring pebbles, and duly threw them onto the pile, sometimes spitting on them first, but some had forgotten, and were now having to search the veld. When I reached the stopping place and took my pebble out of my saddlebag, I heard congratulatory shouting and laughter. A girl cried, "Did you bring a stone for me, too?" An old woman reprimanded her for being pert with a white man.

From here onward the Path climbed an escarpment, winding around many bends. I had to dismount and lead the horse. About halfway up, the marchers ahead stopped. When we got moving again, I saw the cause. In a little enclave beside the trail sat a skinny old man, with his leg stretched out and a very twisted ankle. Some young men were comforting him and lashing together sticks to make a crutch. I said, "Can you ride a horse, grandfather?"

The old man grinned through his pain. "I have never ridden a horse, Nkosane. Surely your white man's horse will resent an old black man and throw me off?"

"No," I said reassuringly, "he is tame. He and I both respect old age."

The old man laughed. The youths carefully lifted him to put him on the saddle. Before scrambling over he motioned for them to wait. He took off his leopardskin cape and spread it meticulously over the saddle, so that he would not touch the leather with his bare legs. He said quietly, apologetically, "We old folks smell," and then settled on the saddle, gripped the pommel with one hand,

and waved with the other. "Look," he declared grandly. "I am a mounted policeman. Salute the servant of the government!" The crowd laughed and cursed happily, enjoying the opportunity to jeer with impunity at a policeman, especially a mounted one.

A boy came forward to take the reins, but I waved him aside. "Never let a stranger touch your reins" was one of my father's rules. I led the horse up the hill, feeling very foolish. No white person was likely to see me, leading a horse like a servant, with a crowing old Zulu in the saddle; but you never know, so I kept my head down.

When we reached the top of the hill, the young men pointed out a kraal close by. We took the old man there. He praised me excessively. "Duma!" he shouted. "Chief of Chiefs! May you grow like a mountain!" I wished him well and headed for Insimbi's place.

Outside the kraal, on the level tableland, I saw hundreds of men. They were forming into companies, most of them with matching shields—black, or black and white, or white, or brown and white. Some companies were in single or double files, stamping to the rhythm of their own chants. Graybeards with long sticks demonstrated songs and steps, shouted orders, and whacked the shins of men who stepped out of line.

I gave the main crowd a wide berth and rode around to the back of the kraal. I halted twenty yards or so from the stockade and waited. A small boy playing there leaped to his feet shouting, "White man! There is a white man!" Some women peered curiously. Presently a man appeared. He was obviously someone of importance. I dismounted and saluted him. He acknowledged my greeting and then asked, anxiously, "What is the matter, child of a white man? Is there trouble? Why have you come?"

I explained that I wanted to see the dancing. Would the chief please allow me? I presented the twists of tobacco.

He took the tobacco and smelled it approvingly. "You have a great liver," he said, "to come into our country, black people's country, on a day like this. But you know how to show respect. Where did you learn Zulu?"

I told him about Ngumbane. "The limping one," he said. "He used to be a fine dancer. I will tell the chief you are here. Take your horse over there." He pointed to a tree beyond a little ravine. "It will be a safe place, but do not offsaddle."

I dismounted under the tree and gave the horse his nosebag. Presently two little girls appeared, one carrying a small pot of beer, the other a grass mat with a lump of meat. I gave them sandwiches in exchange.

As the day wore on, the drilling on the tableland grew more and more orderly. The smaller companies were amalgamating into regiments, performing maneuvers in long waves. They advanced slowly; charged, beating their shields; retreated; advanced again, repeating the exercises until their elderly instructors were satisfied or exhausted.

By early afternoon the exercises were breaking up. Women had for some time been carrying out food and beer, and most of the dancers now sat down, quiet except

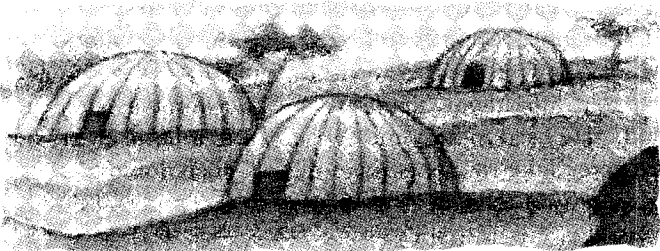
for an occasional show-off who leaped about slashing and stabbing at an imaginary enemy. A few real fights had also broken out, and some spectators were trying to stop them; others were excitedly urging on the combatants or joining in. The chief and other older men were having to intervene, shouting and laying about them with clubs and whips.

Glancing at the group around Insimbi, I saw several arms pointing to me. Soon afterward a youth of about my age appeared. He was bleeding from a head wound and had a weal where a whip had got him. He stood provocatively in front of me and said, "Little white man"—he used an insulting diminutive—"little white man, hear the words of the chief. Insimbi says you must go now. He says in the dusk a white man looks like any other wild creature."

I mounted quickly. "I thank the chief," I said. "I send him respects." I added, condescendingly, "Stay well, little lad," and cantered off.

Many of the women and girls had already left, together with older men who were anxious to reach home before dark. They started off in big groups, which shed fragments as family or neighborhood parties broke off to go their separate ways. No one made way for me. A group of men stood in front of the horse and demanded that I take one of them to ride with me; I had to make a wide detour to get past them. Several times someone said, "What are you doing here, white man?" Once or twice a man deliberately tried to frighten the horse.

I decided not to risk the Path of the Ancients down the escarpment; there were too many little danger points. Instead I went a long way around on the government road and did not get home until after sunset. A few stragglers were still on the Path, but the main traffic had apparently passed.



I FINISHED SUPPER AND WAS GETTING READY FOR BED when my horse became restless. I had tethered him for the night in a little cornfield near the house. The dead cornstalks had been gathered into bundles, which stood like rows of ghostly men in the moonlight. The horse was so disturbed that I feared a predator might be around. Then I heard what had been disturbing him. It was far away but unmistakable: a war song, sung by a great many men. It sounded like a whole regiment.

I had already undone the tether and let the horse canter off before I realized that I now had no means of getting away if I needed to.

The sound came and then went faint. It was an antiphonal song, the leading voices clear and high, the responses muffled but strong. It grew suddenly louder. By visualizing the Path of the Ancients, I could tell how the sound would alter. As the singers went down through the old riverbed, it faded; it grew louder as they emerged, and faded again as they went around the hillock at the Place of Scolding. When they reached the ridge opposite the farmhouse, the sound should almost disappear.

After a moment's silence, too soon for them to have reached the ridge, a new song started, a different sound. I could not hear words, and indeed the song had no words: just *Eee yoh haa haa haa*, starting quiet, rising high almost to a scream, and then falling to the deepest guttural that the singers could reach in their throats and chests. High again, then down, down, *haa! haa!* High, then down low, repeated over and over.

I knew the song, because a gang of laborers on the farm once started singing it. Ngumbane had intervened, very angry, shouting, "We will have no songs like that here." He told me it was a song that had been sung in the old days when warriors anticipated a great killing. "When you sing it, your blood wants blood," he said. In my mind I called it the Bloodsong.

The sound receded when the singers got to where the Path ran behind the ridge, and grew faint as they went down into the old stone quarry. I went indoors with much relief: they were on their way to the hills. Then a great burst of the Bloodsong hit me. A large company of warriors had silently climbed the ridge and was now massing at the head of the clearing that ran down to the house. Obviously the others, on the Path, had gone on singing to provide a cover, so that this party could get close to the farmhouse without being detected.

As fast as I could, I shuttered the windows and locked all the doors except the top half of the kitchen door. I put the pressure lamp to shine out through the door, dragged sacks of meal and seeds to form a little barricade, and loaded both barrels of the shotgun. I put in birdshot, because that was what I mostly used, but then I remembered that when the farmers had formed a commando to get the madman who shot his wife and kids, they all loaded up with slugs or buckshot, so I quickly slipped in buckshot instead.

In the moonlight I could see the great shields of the warriors gleam when they turned. They were now singing the battle challenge: "Shame on the man who is burned in his hut. Come out and fight!" As they sang, they shuffled into some kind of formation. I knew what they would do: they would split into three lots to form the bull, the classical Zulu attack formation. The two horns of the bull advance to harass the enemy's flanks, while the main body, the bull's chest, awaits the right moment for a frontal charge. My father's friends had not been in the Zulu wars, but they often talked about them; their theory was that if you managed to crumple one of the bull's horns the whole force was thereby confounded. One had therefore to con-

concentrate on one horn and bring down as many men in it as possible.

Presently two files of men, rather fewer than I had expected, began creeping down the clearing. I tried to gauge the distance—not easy in the moonlight—and desperately wished I could remember what the *Sportsman's Handbook* said about the range, penetration, and scatter pattern of buckshot. As one horn moved diagonally across the clearing, I cocked both hammers and kept my bead on the leader, wondering whether I should aim at his legs or at his chest. If I only wounded him, perhaps the others would not be deterred. But what if I killed him?

I was puzzled, because the two horns were not advancing to surround the house but were moving obliquely toward the cornfield. The singing of the main body suddenly stopped. After a thin scream of command they all charged, shouting and hissing the clan battle cry. I scrambled out of the kitchen into the storeroom, which gave a view of that side of the clearing. I doubted whether I could get set up in there before they had me. I tore open the window shutter and pushed the gun barrels out, ready for the first man who came within range.

No one was there. But in the cornfield the whole company was stabbing and slashing at the upright bundles of stalks, crying "Die! Die!" or leaping about in shadow combat with unseen enemies. I felt a great warm wetness down my trousers as I shakily put the gun down.

The display in the cornfield lasted only a few minutes. Soon most of the warriors sat down, breathing heavily. I counted only a dozen or fifteen of them. One man walked to the house, deliberately standing in the lamplight. He leaned his shield and sticks against the wall and stood waiting, making a knocking click with his tongue.

I shouted, "What do you want?" immensely relieved that my voice was rough and harsh, not fearful and squeaky. The man saluted in the direction of my voice. I saw that he was a boy, not much older than I was. "Nkosane, we ask for water. We are dying of thirst," he said.

I replied gruffly, "Wait. I am coming," and frantically looked for a pair of trousers to replace my wet ones. I unloaded the shotgun, alarmed to see how shaky my hands were. Then I went out, unlocked the water tank, and gave the youth a tin mug.

He waved to the others. They carefully stacked shields and sticks against the wall and respectfully greeted me. They were all teenagers. Each one drank in turn, taking care not to spill. The last one rinsed the mug and held it over his head, looking at me for permission. I said, "You would not do that if it were beer." They recognized my weak joke as a gesture and laughed uproariously, boasting about their drinking capacities.

I waited for them to go, but they sat down, obviously intending to rest and talk. One youth said, "Nkosane, did you know that old man with the broken ankle?" I recognized the speaker and two of the others as having been among those assisting the old man. I shook my head. He turned to the group and related what had happened. They

appeared to know already, for two of them were miming the old man putting down his cape to protect the saddle. Everyone laughed, and someone said, "He smells like a polecat's backside now, but they say he was a great fighter when he was young." Someone else said, "You did a kind thing, Nkosane. Our little band has come to thank you. That old man is greatly honored in our family. He was the guardian uncle of my father, and of this boy's father." He indicated another youth, who seemed to be the leader. The leader said, "Johnny, you took a thorn from the foot of a stranger. So we give you this praise-name: You Pull Out Thorns for Strangers." The rest applauded, drummed on their shields, and cried "Thorn-puller," "You Pull Out Thorns." We discussed praise-names and the complimentary nicknames of some of the white farmers. My father was called the Dancer, because he stamped his feet when he was angry.

I went into the house and brought out a big tin of rusks and some tobacco. They demolished the food and made rough cigarettes. They asked if I was courting. I fetched a picture of my girlfriend. They stared at it, carefully not touching with their fingers but holding it on open palms, and exclaimed admiringly at her plumpness.

They showed me a big stone ax they had found in a cliff in the hills. They had had it ritually purified, in case it had been used to kill a man: the old women said that small yellow cannibals used to live in those cliffs. They asked whether I had not been scared up at Insimbi's, being the only white person there. The boys who had been with the old man said, "We kept an eye on you where you sat under the tree. If any trouble had started, we would have protected you." The leader assented. "With brave men like us you would have been safe. Did you see us attack that enemy in the cornfield? They outnumbered us many times, but we slew them without mercy. We were heroes, were we not?" There was much laughter as various members of the band enacted their own past or future exploits. I fetched the shield Ngumbane had given me. They examined and admired it, and I had a mock stick fight with one of them: several gave me advice or demonstrated cunning blows and feints.

The moon was sinking toward the western tableland before they left. As they went by, each one said, "Stay well, brother," and clasped me by the forearm. Then they all turned round and cried, "Puller of Thorns! You are one of us," and raised their shields in salute. For the next half hour I could hear their voices, clear and soaring *Eee yoh*, then falling low, deep and ominous, *haa haa haa*. The Bloodsong faded, rose, faded, and finally died in the valleys of the east hills.

I often saw members of the band subsequently, loafing around trading stores, working on farms, or trotting down the highway to the music of a mouth organ. They always greeted me with the greatest friendliness, but none of them ever again called me brother or said, "You are one of us." □

LOVE SONNETS

BY PABLO NERUDA

II

Love, what a long way, to arrive at a kiss,
what loneliness-in-motion, toward your company!
Rolling with the rain we follow the tracks alone.
In Taltal there is neither daybreak nor spring.

But you and I, love, we are
together, from our clothes down to our roots:
in the autumn, in water, in hips, until
we are together—only you, only me.

To think of the effort, that the current carried
so many stones, the delta of Boroa water; to think
that you and I, divided by trains and by nations,

we had only to love one another:
with all the confusions, the men and the women, the earth
that makes the carnations rise, and makes them bloom!

VI

Lost in the forest, I broke off a dark twig
and lifted its whisper to my thirsty lips:
maybe it was the voice of the rain crying,
a cracked bell, or a torn heart.

Something from far off: it seemed
deep and secret to me, hidden by the earth,
a shout muffled by huge autumns,
by the moist half-open darkness of the leaves.

And there, awaking from the dreaming forest, the hazel-sprig
sang under my tongue, its drifting fragrance
climbed up through my conscious mind

as if suddenly the roots I had left behind
cried out to me, the land I had lost with my childhood—
and I stopped, wounded by the wandering scent.

XXII

Love, how often I loved you without seeing—without remembering you—
not recognizing your glance, not knowing you, a gentian
in the wrong place, scorching in the hot noon,
but I loved only the smell of the wheat.

Or maybe I saw you, imagined you lifting a wineglass
in Angol, by the light of the summer's moon;
or were you the waist of that guitar I strummed,
in the shadows, that rang like an impetuous sea?

I loved you without knowing I did; I searched to remember you.
I broke into houses to steal your likeness,
though I already knew what you were like. And suddenly,

when you were there with me I touched you, and my life
stopped: you stood before me, you took dominion like a queen:
like a wildfire in the forest, and the flame is your dominion.

XXXIII

Love, we're going home now,
where the vines clamber over the trellis:
even before you, the summer will arrive,
on its honeysuckle feet, in your bedroom.

Our nomadic kisses wandered over all the world:
Armenia, dollop of disinterred honey—:
Ceylon, green dove—: and the Yangtze with its old
old patience, dividing the day from the night.

And now, dearest, we return, across the crackling sea
like two blind birds to their wall,
to their nest in a distant spring:

because love cannot always fly without resting,
our lives return to the wall, to the rocks of the sea:
our kisses head back home where they belong.

—translated by Stephen Tapscott



*Nobody thought we
needed xerography until we had it*

COPIES IN SECONDS

BY DAVID OWEN

A FRIEND OF MINE CALLED NOT LONG AGO TO ASK IF I would send him a copy of a certain newspaper clipping. I said I would. I rooted around in the stuff on my desk and found the clipping near the bottom of a big stack of papers. I moved it to the top and made a mental note to take it to the drugstore across the street, which has a coin-operated photocopier. Because I don't work in an office, I can't just run down the hall and make a few thousand free copies of a clipping, a recipe, my hand, a newsy Christmas poem describing my family's heartwarming experiences during the previous year, or anything else.

Several days passed. Every time I went out, I either forgot about the clipping or remembered it and decided not to do anything about it. If there's anything I hate, it's carrying around a large, loose, irregularly shaped piece of paper while I do various errands. If someone had grabbed me by the cheeks and told me to march right over there and make that copy, I would have replied, like *Bartleby*, "I would prefer not to." I toyed with the idea of retyping the entire newspaper article—a pleasant way to spend an afternoon. Gradually the distance between my apartment and the drugstore grew in my mind to the point where it might as well have been the distance between St. Louis and the moon.

Then, early one morning as I lay sleepless in bed, I came to the sudden, powerful realization that I would never make that copy unless I made it on one of those little personal copiers that Jack Klugman is so enthusiastic about on television. The necessity for making large expenditures often comes to me in such a flash. I now believed, in other words, that walking across the street to spend twenty cents for a single photocopy was less convenient and more irrational than driving across town to spend several hundred dollars on an entire machine that I would then have to find a permanent place for in my apartment.

The next day I drove over to a discount electronics store and bought a Canon PC-10 personal copier for \$475. (This was quite a bargain; the manufacturer's suggested retail price is \$795.) Canon personal copiers use special cartridges that contain, as Jack Klugman says, "the entire copying process." The cartridges are sold separately. I

bought two, for about fifty dollars each. I also bought five 500-sheet packages of ordinary paper, which were on sale, for a total of just \$15.

A Canon personal copier is very small—about the size of two toaster ovens. But the box it comes in is very large—about the size of six or seven toaster ovens. Maneuvering the box and the cartridges and all that paper up to my apartment turned out to be quite a problem. I finally made it, though, and set up the machine without much trouble. I put the clipping on the platen, inserted a sheet of paper, and watched a crisp, clean copy emerge from the other end.

A feeling of well-being and deep inner satisfaction coursed through my veins and arteries. My life had achieved a sleek new efficiency. I could now enjoy in my own home a pleasure usually known only to people who have real jobs. "So long, sucker," I imagined myself saying to the man who runs the drugstore across the street.

I made another copy of the same clipping and threw away the first one. Then I made a third and threw away the second. Then, after a panicky moment in which I wondered whether I had not just satisfied my copying needs in their entirety, I opened the owner's manual and began, page by page, to copy that.

EVEN IN THE DAYS WHEN I HATED MAKING COPIES, the ability to do so was something I took for granted. Much of journalism consists of photocopying things that other people have written and finding slightly different ways to write them again. Obviously, this has not always been possible. Twenty-seven years ago Jodi Stutz could not have lost her job at Deere & Company, in Moline, Illinois, as she did in 1980, for making a Xerox copy of her bare bottom, because twenty-seven years ago Xerox office copiers did not exist. Until relatively recently, making facsimiles of ordinary business documents was so difficult and expensive that almost no one bothered to do it.

The first office copiers were, as is well known, monks. When Gutenberg invented movable type, in the early 1400s, monkdom trembled. Some time afterward the Abbot of Sponheim wrote a lengthy treatise arguing that monks "should not stop copying because of the invention of printing." To ensure that his treatise got the readership it deserved, the Abbot had it printed. A couple of hundred

Chester Carlson at forty-four and at eighteen. Clockwise: a key patent; a medal for the invention; Carlson's pen; the first dry copy; a patent drawing; Carlson's glasses

years went by. In the mid-1600s someone pressed a moist piece of tissue paper against a written document, causing some of the ink of the original to transfer to the tissue. A couple hundred more years went by. Blueprints were invented in 1842. Typewriters, carbon paper, and mimeograph machines were introduced a few decades later.

Carbon paper and mimeograph machines were improvements over hand copying, but neither could be used to reproduce documents that already existed. Mimeography, furthermore, was a terribly inefficient way to make a small number of copies, since each document required its own master. Schoolchildren love mimeograph copies, because they smell so terrible, but almost everyone else hates them. Photostat machines, which were introduced in the early 1900s and which make copies photographically on sensitized paper, were much too expensive for ordinary office use. They were also too big, too slow, and too hard to use. When a businessman needed a copy of something, he generally called in the functional equivalent of a monk.

This didn't really begin to change until the middle of our century, 500 years after Gutenberg. In the early 1950s the Minnesota Mining and Manufacturing Company (3M) and Eastman Kodak introduced office copiers called, respectively, Thermo-Fax and Verifax. Both were small and inexpensive. Their chief drawback was that they made dreadful copies. Thermo-Fax used a heat-sensitive paper that tended to continue darkening long after it had left the machine. Verifax produced copies that were even stinkier than mimeographs. Neither machine made copies that were archival, or permanent. Both machines required special paper, which over time cost users a fortune.

Office copying as we know it didn't arrive until 1960. That year a small company in Rochester, New York, began marketing its Haloid XeroX 914 Office Copier (the second capitalized *X* is a flourish that the company later dropped). The 914, unlike its competitors, made good, permanent copies on ordinary paper. The machine, though large, was simple enough for a child to use. Haloid Xerox, Inc., (which had started life as the Haloid Company and is known today as the Xerox Corporation) had been marketing a small number of machines employing its revolutionary copying technique for a decade, but the 914, the first model intended for general office use, was also the first to catch on in a big way. The number of copies made in American offices grew from around 20 million in 1955 to 14 billion in 1966 to approximately eleven billion today.*

It is often interesting to speculate on what life would be like if some conspicuous element of it were removed. Suppose, for example, that the universe contained no solid

material that was also transparent—no glass or plastic or anything similar. Without such a substance we would have no windshields, no light bulbs, no contact lenses, no (good) aquariums, no television sets, and so on. What would we do? The loss of xerography—as the plain-paper copying process that Xerox introduced is known—would be less dramatic, but its impact would still be profound. We would have no Pentagon Papers, fewer lawyers, more secrets, larger forests, more (fewer?) bureaucrats, less espionage, better memories, fewer cartoons on our refrigerators, and a lot less information in general. Xerography places rapid mass communication within the reach of almost anyone. To see how potent and indeed subversive such a capability can be, one need look no further than the Soviet Union, where copiers are more closely guarded than computers.

The Xerox machine has given ordinary people an extraordinary means of preserving and sharing all sorts of information. And yet we take it for granted. The usual cure for this sort of neglect is to focus obsessive attention on the subject for a short time and then never think about it again. This is what I intend to do.

MOST PEOPLE SPEND MORE TIME THINKING ABOUT how photocopiers don't work than about how they do. "Call key operator" and "Check paper path" have become familiar modern imperatives on a level with "Fasten seat belt" and "Shake well before using." It is commonly believed that the stubbornness of many photocopiers results from the same declining attention to quality that makes the present in all respects worse than the past. But this is not the case. A xerographic copier is a marvel of extremely intricate engineering that, like the Post Office, actually works much better than one has any right to expect.

Every photocopier that uses ordinary paper employs some version of the basic xerographic technology embodied in the Haloid XeroX 914. At the heart of this technology is a specially treated surface, usually in the shape of a cylinder, that is known as the photoreceptor. In the 914 the photoreceptor was made of the element selenium. Like a balloon that has been rubbed against a wool sweater on a cold day, selenium is capable of holding an electrical charge. Unlike a balloon, selenium is capable of holding this charge only in the dark. If you shine a light on a charged piece of selenium, the charge will vanish from every part that is illuminated.

If you shine the light on a printed page so that an image of the page is projected onto a charged selenium drum, the drum will retain its charge in those places where no light falls (that is, in those places corresponding to the dark ink on the page) and lose it everywhere else. If you then sprinkle the drum with an oppositely charged powdered ink, the ink will stick to the charged parts of the selenium surface, in the same way that house dust sticks to a staticky balloon. This produces on the surface of the drum an exact

*Some of the statistics in this paragraph are made up. According to the public-relations office at Xerox, the world made 522 billion copies last year on xerographic machines sold by Xerox and its competitors. No one knows the exact number, though, because many copies don't get counted. No one, for example, has called me to ask how many copies I have made of the credit cards in my wallet (three), so estimates are off by at least that number. The Xerox Corporation makes more copies each year simply in testing its machines than the entire world made for all purposes thirty years ago.

mirror image of the original printed page. The drum rolls over a piece of paper, transferring the image to it. The copy is made permanent in a device called a fuser, a small heater that melts the powdered ink and binds it to the page.

A small, unrepresentative minority of readers will undoubtedly write in to claim that they thought of just such a process back in 1930 or so and would I please ask Xerox to send along a royalty check as soon as possible. These readers, though valued as subscribers, must be dismissed as crackpots. Xerography is unusual among inventions in having been conceived by a single person. There was no one in France or Russia who was working on the same thing. The Chinese did not invent it in the eleventh century B.C.

The inventor of xerography was a shy, quiet man named Chester Carlson.

For a full decade electrophotography, as he called the process, was his private obsession. No one took him seriously except his wife. All of the twenty-one major corporations he approached expressed a total lack of interest, thus passing up a chance to manufacture what would later be called, more than once, the most successful commercial product in history. So persistent was this failure of capitalistic vision that by the time the 914 Office Copier went into production, the original patent covering its internal processes had expired.

CHESTER CARLSON WAS BORN IN SEATTLE IN 1906. HIS mother died of tuberculosis when he was seventeen. His father was an itinerant barber crippled by arthritis. The family moved briefly to Mexico for therapeutic reasons, and then for financial reasons settled in a remote and impoverished corner of California's San Bernardino Valley, where Carlson was sometimes the only student in the local school. He worked his way through junior college and the California Institute of Technology, from which he graduated with a degree in physics. After college he worked for a short time as a researcher at Bell Telephone Laboratories. He ended up in the New York patent



Chester Carlson with the materials he used to produce the first xerographic copy, in 1938

office of a small electronics outfit called P. R. Mallory & Company.

Carlson said in the early 1960s, in a short film produced by Xerox, "In the course of my patent work I frequently had need for copies of patent specifications and drawings, and there was no really convenient way of getting them at that time." Specifications had to be retyped and then proofread for errors; technical drawings had to be sent out of the office to be copied, at great expense, on a Photostat machine. Carlson often wished that there were a simpler method. When none presented itself, he decided to invent one.

Carlson approached this task with an unrelenting single-mindedness that one would not hesitate to label lunacy had the outcome been different. Perhaps it was lunacy all the same. For many months he spent spare moments at

the New York Public Library, poring over fat technical volumes. He concluded early on that his copying device, whatever it turned out to be, would have to depend on a process "that used light to affect matter in some way." This process could not be photography, he reasoned, because photography was too well understood and had attracted too many well-financed researchers. If photography held the answer, he would not be the one to find it.

One day in the course of his reading Carlson came upon a property called photoconductivity. The electrical conductivity of certain materials, he read, can be affected by exposure to light. Only a very few materials behave in this way. One of them is sulfur. Carlson bought some at a chemical-supply store and tried to liquefy it by holding it over a burner on the kitchen stove, his principal piece of laboratory equipment. The sulfur caught fire and filled his apartment with a cloud of noxious fumes.

Chester Carlson became quite well known in his apartment building. The odor of rotten eggs drifted under his door and permeated the hallways. Small explosions rocked the walls. One day a young neighbor dropped by to complain. Carlson managed to charm her, and she later married him. Somewhat reluctantly the struggling inventor surrendered two of the burners on his stove.

COURTESY XEROX CORPORATION

Married life being what it is, Carlson soon gave up the other two burners as well. He moved his laboratory into a small apartment in Queens owned by his mother-in-law. He also hired an assistant, an unemployed German physicist named Otto Kornei. Carlson couldn't afford to pay very much, but Kornei had no other prospects. For several years Carlson had been performing his experiments without success. Now, with Kornei's assistance, he began to make some progress. The two men coated a metal plate with sulfur. Then Carlson wrote the date and place—10-22-38 Astoria—in black ink on a glass slide. He rubbed the sulfur-coated plate with a cotton cloth to give it an electrical charge, placed the slide against it, and held them beneath a powerful lamp for a few seconds. He then removed the slide and sprinkled black powder on the plate. Much to his astonishment, a blurred image of his inscription appeared. Hands trembling, Carlson pressed a piece of waxed paper against the plate and peeled away the world's first xerographic copy.

Carlson was elated; Kornei was depressed and disappointed. The little piece of waxed paper didn't look like much to him. (It didn't look like much to me, either, when I saw it in its display case at the Smithsonian Institution.) Fond of Carlson but concerned about his future, Kornei soon accepted a job offer from IBM.

Carlson spent the next five years tinkering with his invention and trying to find a company that could appreciate its potential. IBM, RCA, and General Electric, among others, turned him down. Finally, in 1944, at the end of his wits and the bottom of his bank account, he was led by a chance conversation to the Battelle Memorial Institute, a private research foundation in Columbus, Ohio. Battelle offered to spend \$3,000 developing his idea in exchange for 75 percent of future royalties. Carlson happily agreed and began to spend his spare time in Columbus. The next year his wife divorced him.

IN 1945 THE HALOID COMPANY EARNED ABOUT \$100,000 manufacturing photographic paper and related supplies in Rochester, New York. This was small potatoes and seemed even smaller, because one of Haloid's closest neighbors was the Eastman Kodak Company. Many Haloid employees believed that Kodak could put them in the poorhouse at any moment and that its failure to do so was a sign less of charity than of indifference. Tired of playing sandlot ball in the shadow of a big-league team, Haloid's top management developed a keen interest in finding another line of business.

One day John Dessauer, Haloid's chief of research, noticed a brief account of Chester Carlson's discovery in a technical journal. Electrophotography sounded promising, so he persuaded Joseph C. Wilson, Haloid's president, to accompany him to Columbus for a demonstration. Wilson, an inspired executive who occupies a nearly deific position in Xerox's corporate memory, was impressed. (Wilson died in 1971, at the age of sixty-one, while having lunch with

Nelson and Happy Rockefeller in Manhattan.) Early in 1947 Haloid agreed to support Battelle's research in exchange for the right to manufacture products based on it. This commitment taxed Haloid's limited resources, but Wilson and his lieutenants were more excited by copiers than they were by photographic paper.

Haloid introduced its first xerographic copier in 1949. (The word *xerography* was coined by a classics professor at Haloid's request; it is based on Greek words meaning "dry writing.") This first copier was called the Model A or, more familiarly, the Ox Box. It was a sprawling, awkward device that actually consisted of three separate machines. The selenium photoreceptor was not a drum, as in the 914. It was a flat, heavy plate. The operator had to hoist it from one machine to the next and repeat the entire time-consuming process for every copy. The operating manual was filled with dire instructions:

Dry the plate surface by striking it lightly and briskly with a clean, dry, UNTOUCHED portion of cotton. . . . With a spoon, carefully spread one-fourth of a teaspoon of XeroX Toner over the developer. . . . When mounted in the process tray, the four tabs of the electrode should protrude no more than approximately 1/64" above the level of the side gaskets, nor should they go below the side gasket.

Haloid shipped out several Model As for field testing. All were quickly returned. "Too complicated" was the verdict. The machine might have disappeared altogether, and taken Haloid with it, had it not serendipitously turned out to be an excellent and inexpensive maker of paper masters for offset printing presses.

(Offset printing is almost impossible to understand. It is based on the principle that oil and water don't mix. You can make a simple offset press by taking a smooth stone and drawing a picture on it with oil; dipping the stone in water, which will adhere to the bare stone but not to the oily image; dipping the stone in a non-water-soluble ink, which will adhere to the oily image but not to the wet stone; and pressing the stone against a piece of paper. In an offset press using a xerographic master the stone is replaced by a piece of paper and the oil is replaced by a powdered ink that repels water. Before xerography came along, offset masters had to be made using a complicated photographic process.)

A handful of other clunky xerographic products followed the Ox Box over the next decade. All found narrow applications and small but adequate numbers of devoted users, but none was the compact, automatic office copier that Carlson and Haloid dreamed of. Work on this machine proceeded alongside the other projects, but progress was slow.

"Xerography went through many stages in its development at which any sane management committee would have been justified in turning it down," a Battelle staffer said later. "There always had to be something extralogical about continuing."

Carlson continued to contribute to the development of

his invention, first as a frequent visitor at Battelle and later as a consultant at Haloid. Rapidly, though, the responsibility for realizing his vision was transferred to others. When the 914 took off, his royalties made him an extremely wealthy man. Carlson retired to a large house on Clover Street, in Rochester, where he and his second wife entertained friends by burning incense and conducting séances. He died in 1968.

WHEN JOHN RUTKUS CAME TO THE HALOID COMPANY, in 1955, his first assignment was to make himself a desk. Money was scarce in those days. All available resources were being pumped into the development of xerography. Rutkus was an engineer. He took an old drafting table and positioned the top to lie flat.

Rutkus's second assignment was to create a rough design for the machine that would become the 914. The original goal at Haloid was to build an office copier that would be small enough to sit on a desk. It soon became clear that this goal was unrealistic. The copier that began to take shape on Rutkus's drawing board was more nearly the size of a desk.

Blocking out the internal design of the 914 required a great deal of imagination, because almost none of the systems that would constitute it had been perfected, or even conceived. The research and engineering departments worked side by side, inventing the machine as they went along. For example, Haloid was determined to build a copier that used cut sheets of paper. This produced enormous problems. Xerography involves the creation of an effect similar to static electricity, and when a piece of paper comes in contact with a charged photoreceptor, it sticks like wallpaper. How to peel it off? Vacuum systems didn't work, because they tended to slurp up the powdered ink. Mechanical grippers marred the delicate surface of the drum. One day, while pumping up a child's bicycle tire in his garage, Rutkus conceived of a system in which tiny nozzles would lift the leading edge of each sheet with puffs of air. He stuck a piece of paper to the hood of his car and blew it off with the bicycle pump. The idea was incorporated in the machine.

Haloid didn't have enough money to build custom parts for its pre-production models. Bolts, springs, and pieces of old cars were scavenged from a junkyard on Clinton Avenue, in Rochester. The plan for the 914 called for a photoreceptor drum about eight inches in diameter. The engineers tried welding sheets of metal into cylinders and coating them with selenium, but they couldn't get the selenium to stick to the welds. At the junkyard one day an engineer stumbled over a length of discarded aluminum pipe. He took out his tape measure. The outside diameter was eight and a half inches. He bought ten feet, took it to a couple of brothers who ran a small machine shop nearby, and had them tool it down. The pipe was cut into short lengths, coated with selenium, and installed in the machines.

Another problem was the powdered ink, or toner: no one knew how to make one that would work. Haloid's toner plant was nothing more than a drafty old garage on Avis Street. (The optical group was located in the basement of a Masonic temple.) People who worked there went home each night looking like coal miners. The 914 required a toner that would fuse with paper at a low temperature, because heat destroys the photoconductivity of selenium. Avis Street periodically came up with promising batches, but then the engineers would change the design of the fuser and hand down a new set of specifications. Sizing was also a problem. New batches of toner frequently contained large, anthracitic chunks, referred to by the engineers as charcoal. When a piece of charcoal got into a machine, it ended up as a smoking blob in the middle of a piece of paper. Often it also wrecked the photoreceptor. The head of the toner group complained that the engineers were making impossible demands, but finding an acceptable formula was a do-or-die proposition. "If we hadn't accomplished the lower-melt toner," Rutkus said later, "we wouldn't have had a product." In the meantime Haloid simply proceeded on the assumption that a suitable toner would be found.

Producing toner was one problem; getting rid of it was another. Nearly a third of the toner that forms each image remains stuck to the photoreceptor after a copy is made. This residue has to be cleaned away. With the Ox Box cleaning had had to be done manually, by rocking the selenium plate back and forth in a tray filled with diatomaceous earth—a pale, claylike powder composed of the remains of tiny organisms. (Earlier models had used coffee grounds, soybean meal, flax seed, and corn meal; all attracted mice.)

The 914 was going to be fully automatic, so a different method had to be used. The designers settled on a rotating fur brush. Beaver and raccoon pelts were tried and rejected. The belly fur of Australian rabbits, it was discovered, worked just about right. The brush had to be trimmed to a very tight tolerance: if the fur was too short, it wouldn't clean the drum; if it was too long, it would mar the surface. The engineer who supervised the final production of the 914, Horace Becker, took a rabbit pelt to a local furrier named Crosby Frisian and asked him if he could trim it to the proper length, give or take a sixty-fourth of an inch. Frisian's business was making fur coats. He took the yellow tape measure from around his neck and said, "Show me what a sixty-fourth is."

Even after the toner problems had been solved, the 914 was liable to burst into flames. If paper didn't move through the fuser fast enough, it caught fire. Haloid's early copiers had contained fire extinguishers that kept the heat away from the drum and held damage to a minimum. The engineers began to design a similar system for the 914. Work proceeded apace until the marketing department found out. Fire extinguishers in an office machine? They were incredulous. *Fire*, which had always been a problem with xerographic machines, was a word that did not cross

their lips. When they discussed the problem at all, they called it *scorching*. Black smoke and orange flame could be billowing from a machine and the Haloid repairman would scratch his head and say, "Hmmm, there seems to be a little scorching here." At last a compromise was reached. Fire extinguishers were included, but they were called scorch eliminators.

NEAR THE END OF its harrowing effort to develop the 914, Haloid suffered a momentary failure of nerve. The company had no manufacturing facilities to speak of. Demand for its early copiers had never been large enough to require anything so grand as a factory. As the day of reckoning drew near, Joseph Wilson decided that he owed it to his stockholders to explore less risky methods of bringing the 914 to market. He invited IBM to consider a joint venture. IBM hired Arthur D. Little, an old and distinguished management-consulting firm in Boston, to determine just how large the market for an office copier might be.

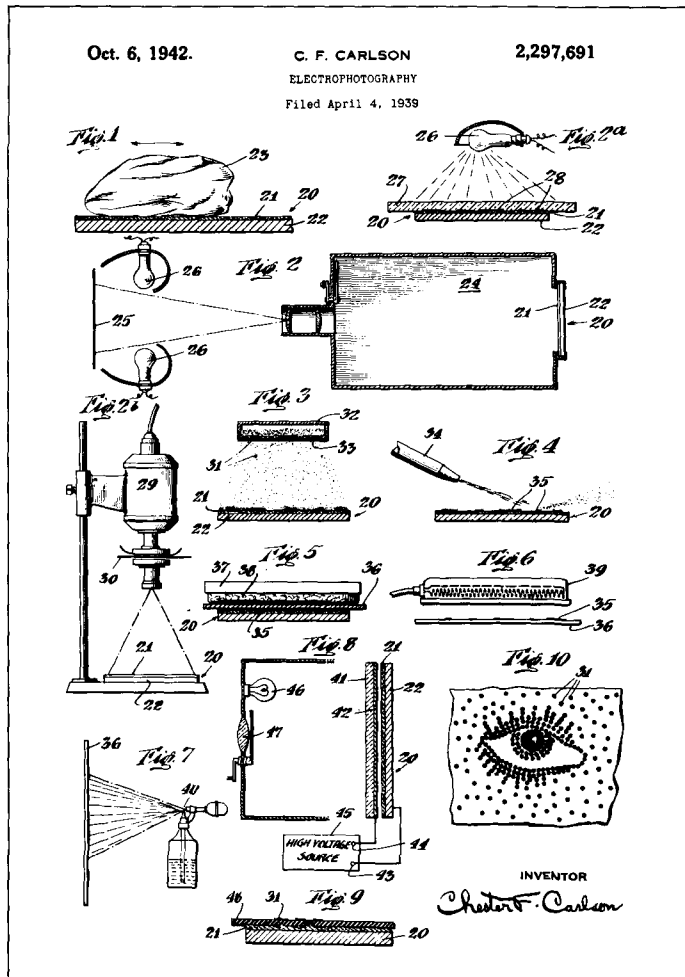
Haloid had already conducted an impromptu study of the same question. A couple of young salesmen had traveled to several northeastern cities and asked people in various businesses how many copies they used. Thermo-Fax and Verifax were already on the market, so people had begun to develop a sense of what office copiers could do. In Philadelphia one day, one of the salesmen stopped by the local Social Security office, which used one of the new coated-paper machines.

"How much of that paper do you use?" he asked.

"What do you mean—how many carloads, or what?"

The Haloid man's eyes lit up. "Carloads?"

The consultants from Arthur D. Little came to a very different conclusion. The copier was far too large and expensive to find a market, they said. The nation's total demand, now and in the future, could be satisfied by a maximum of 5,000 machines. "Model 914," their report concluded, "has no future in the office copying market." IBM politely declined to become involved.



Chester Carlson's patent, filed on April 4, 1939, describing his invention: electrophotography

Haloid's executives swallowed hard but elected to go ahead. The first production model rolled off the assembly line in 1959. "Rolled off" is literally correct: the first 914s were assembled on wooden pallets with wheels on them. When a worker finished with his part of the machine, he pushed the pallet to the next station. The pallet could be tilted sideways so that the copier, which was the size of a deep freezer and weighed more than 600 pounds, could be squeezed through an office door.

Demonstrating the 914 was difficult. Only a few of the machines existed (at first the factory turned out just five a day), and they were too big to tote around. The solution, Haloid decided, was television. The company had spent so much money that spending even more was eerily euphoric. The 914 commercial, which first

aired in 1960, showed a businessman at a desk.

"Debbie, will you please go make a copy of this?" the man asks a little girl.

"Okay, Daddy," she says.

"That's my secretary."

Debbie goes skipping off and copies the letter by pressing a single button. A voice explains that the 914 makes a first copy in less than a minute and produces seven copies a minute after that. Debbie scoops up the copy, turns, stops, and goes back to make a copy of her doll.

"Thank you, Debbie," her dad says. "That was fast. Which is the original?"

Debbie looks at the papers and scratches her head. "I forget!"

The Debbie spot and several other major promotional efforts were phenomenally successful. An angry competitor demanded proof that Debbie was not a midget; how could a child operate a machine like that? Haloid, which by now was well on its way to becoming the Xerox Corporation, very nearly found itself with more business than it could handle. The company's revenues grew from \$32 million in 1959 to \$60 million in 1961 to more than \$500 million in 1966. A ten-thousand-dollar investment in Haloid stock in 1960 was worth a million dollars by 1972.

“THE MORE YOU UNDERSTAND ABOUT XEROGRAPHY,” Robert Gundlach says, “the more you are amazed that it works.” Gundlach must be more amazed than anybody, because no one understands the subject better than he. At last count he held 131 patents, most of them involving xerography. (He has also invented a snowmaking system, a sundial, an unusually comfortable backpack, and a 20,000-volt electrostatic generator that can be manufactured for just five dollars.) Gundlach wasn’t officially involved in the development of the 914; by the time that project got under way, he was hard at work on the machines that would follow it. But when members of the 914 team had a problem, they went to him. More often than not he had a solution.

Like many gifted inventors, Gundlach seems to have been spawned by alien beings. When I met him, at the 914’s induction into the Smithsonian Institution last year, he was wearing light-blue pants, a light-blue plaid jacket, a light-blue striped shirt, and a light-blue tie with some sort of large bird painted on it. He is tall, gaunt, and tanned—like a rancher. In his office at the Xerox research facility, outside Rochester, he has a small, smooth stone that he likes to spin on the surface of his desk. When he starts it going counterclockwise, it spins along smoothly for a while and then begins to wobble. All of a sudden it reverses direction and spins the other way.

When I first saw this, I wondered whether Gundlach had not just inadvertently revealed an interesting fact about his planet of origin. But it turns out that the spinning stone has a terrestrial explanation. The stone is asymmetrical. When it spins counterclockwise, it starts to vibrate, converting rotational energy to translational. This somehow causes it to reverse direction, making it appear to violate the law of conservation of momentum.

Gundlach’s father was also an inventor. His one patent was for Wildroot Cream Oil. When he made his first batch, he put it in a tube, anticipating Brylcreem by many years. Executives at Wildroot, where he worked, didn’t like it; they thought it looked like toothpaste. He spent a few years in bitter disappointment. Then the Second World War depleted the nation’s supply of alcohol, the principal ingredient of Wildroot’s bottled hair tonic. Gundlach’s invention was alcohol-free. He added a little more water to it, so that it, too, could be poured from a bottle, and resubmitted it. This time the executives loved it. Reminiscing in his office, Robert Gundlach began to sing: “You’d better get Wildroot Cream Oil, Charlie, start using it today, something, something Cream Oil, Charlie, chasing all the girls away.” As a teenager, he spent a summer standing over a large vat in Buffalo, mixing all the Wildroot Cream Oil in the world.

One of Gundlach’s most important contributions to the 914 was helping to solve its paper-handling problems. “I had a friend who took physics with me,” he said. “Every time we went into an exam he said, ‘Force equals mass times acceleration and you can’t push on a rope. That’s all you need to know about physics.’” You also can’t push a

piece of paper through a Xerox machine; you have to pull it. In addition to the problems involved in unsticking paper from the photoreceptor drum, there were equally tenacious problems involved in sticking it on in the first place. The 914 had to handle all kinds of paper, from card stock to onionskin, and it had to handle them in all climates and humidities. Paper in New Orleans is soggy than paper in Cincinnati, and it behaves differently in the machine. Different kinds of paper have different kinds of grain, which affects how and whether they will curl. Curl added in one part of the process has to be subtracted in another. The way paper is cut during manufacturing puts a burr on the edges, which makes it difficult to separate one sheet from another. And so on.

Gundlach went into semi-retirement this year. He had reached retirement age, and he needed to pick a date. He selected January 15—exactly thirty-three and a third years, one third of a century, since he had joined the company. He was too valuable to be let go entirely, so Xerox offered him a small staff and his own laboratory, where he still works three days a week. Many of his current efforts are directed at enabling Xerox to enter the very-small-copier market, which is dominated by the Japanese, should it ever decide that it wants to.

THE JAPANESE ARE A CONSTANT SOURCE OF CONCERN at Xerox. Not far from Gundlach’s office is a sort of museum of competing copiers, most of them built by Japanese companies. The man in charge of this collection is Hal Bogdonoff. Like the commander of the United States Army unit that stands in for the Russians in war games, Bogdonoff has so thoroughly immersed himself in the minds of his adversaries that he now thinks more like them than like his employer. Ask him about a new Xerox product, and he confesses ignorance. Ask him about someone else’s machine, and he can describe it from the screws up. His group conducts detailed autopsies of other companies’ products, carefully analyzing each new feature and making precise estimates of manufacturing costs.

Among the first things one learns upon tearing apart other people’s machines is that there is really no way to make a copy on plain paper other than the way that Chester Carlson invented. There have been a great many advances in xerography over the years, but every machine on the market today takes as its starting point Carlson’s original patents. Those patents gave Xerox an extraordinary competitive advantage in the 1960s. Carlson had worked in a patent office, and he knew how to protect an invention. Xerox’s monopoly lasted until the 1970s, when the last of the early patents expired.

Xerox’s grip on the copying market was tested in three major lawsuits in the 1970s. First Xerox sued IBM for patent infringement. Then, in 1972, the Federal Trade Commission sued Xerox for violating antitrust laws. The next year SCM Corporation sued Xerox for the same thing. All three suits dragged on for years, in part because the inven-

tion of xerography had made it possible for lawyers to turn pre-trial discovery into an open-ended orgy of photocopying. Xerox eventually prevailed in the IBM and SCM suits, but a 1975 settlement with the FTC required it to give its competitors licenses on its office-copier patents.

Xerox did not handle its first taste of real competition with much aplomb. The company's salesmen had been accustomed to sitting around all day with their feet on their desks, waiting for the phone to ring. Now their customers discovered that they had alternatives. In addition, Xerox's breakneck growth in the 1960s had largely destroyed the fraternal spirit that had enabled a rinky-dink company to transform itself into one of the most powerful corporations in the world. In the early days there had been no separation between the research and engineering departments; a discovery by one was savored by both. In the 1970s product development was snarled in bitter bureaucratic rivalries. Meanwhile, the Japanese prospered.

It is greatly to Xerox's credit that it responded to these difficulties not with demands for tariffs and trade restrictions but with a full-scale rethinking of the way it did business. The company began to pay more attention to its customers. It also threw out its old manufacturing system and built a new one on the Japanese model, cutting costs in half. Today Rochester is one of the few cities in the United States that has a positive balance of trade. Copiers assembled at the Xerox plant in Webster, just beyond the city limits, are shipped directly to Japan, where they have done well in a tight market. Here at home, in spite of increasingly stiff competition from the Japanese, Xerox's share of the copier market is actually growing.

Partly because Xerox has been so successful, employees speak of their company's competitors with open admiration. Canon in particular has emerged as a powerful and innovative force in xerography, not only with its tiny personal copiers but also with its larger machines. When I paid my visit to Bogdonoff, he and his staff were especially impressed by an "intelligent" Canon copier that they were dissecting. In place of some of the usual lenses and mirrors the Canon contained a "charged couple device array"—a computer chip that converts light into digital information. This information can be stored in memory or transmitted to a laser printer. The machine can take an image, blow it up vertically, shrink it horizontally, reverse it, take another image from memory, superimpose it on the first, and print the combined picture in a matter of seconds.

I was extremely disappointed to learn that a laser printer is not a dangerous machine in which a ray gun burns crisp black letters on clean sheets of paper. It is, instead, a xerographic device in which the laser is used to "write" directly on the surface of the photoreceptor, which then turns out a hard copy in the manner prescribed by Chester Carlson. As has happened with a number of innovations over the years, Xerox was the first to think of laser printing but not the first to use it in a commercial product.

Laser xerography will play a large role in the much discussed office of the future. A laser, in combination with a

microprocessor, makes it possible to create copies without originals. Secretaries, hovering above the floor in streamlined rocket chairs, will create lavishly illustrated documents on their desktop microcomputers and transmit them instantaneously halfway around the world, where they will be printed, collated, and bound on laser copiers without the intervention of human hands.

Actually, everything except the hovering is already being done. In the future it will continue to be done, only more so. Canon builds laser printers and licenses its technology to a number of other companies, including Hewlett-Packard and Apple. Xerox has made up for its early hesitation with several laser printers of its own. As has already begun to be apparent, working in the office of the future will be a lot more fun for secretaries than for executives, who will spend more and more of their time figuring out ways to lay their hands on some of that neat stuff.

LOOKING BACK FROM MY RELATIVELY MODEST HOME office of the present, I find it amusing to consider how unfamiliar xerography once seemed. Shortly after the 914 was introduced, a journal for librarians pointed out, in the tone of voice that Christopher Columbus must have used to describe the New World to Queen Isabella, that the curious new machine might be used to make copies of old books. In a 1967 *New Yorker* article about the Xerox Corporation, John Brooks described an even more astonishing application:

One rather odd use of xerography insures that brides get the wedding presents they want. The prospective bride submits her list of preferred presents to a department store; the store sends the list to its bridal-registry counter, which is equipped with a Xerox copier; each friend of the bride, having been tactfully briefed in advance, comes to this counter and is issued a copy of the list, whereupon he does his shopping and then returns the copy with the purchased items checked off, so that the master list may be revised and thus ready for the next donor. ("Hymen, iö Hymen, Hymen!")

I suppose that in the early days of the automobile it was not thought unusual to point out that the new invention might be employed to "facilitate travel," and so on. Nowadays I find it much more difficult to discover things that xerography *cannot* be used for. I now have at least two of almost everything I once had one of. My only regret is that these copies were made without the intervention of a laser. I mentioned this to a friend, who in turn showed me an article from *The New York Times* in which it was pointed out that much of the photocopying done today is entirely unnecessary.

An interesting point, I thought. I took the clipping home and made a copy. □

A patent drawing; an aluminum drum; early nameplates; Model A copiers; the first 914; C. Peter McCollough and Joseph C. Wilson, of Haloid; a sales brochure; selenium pellets



MUSIC

THE TOSCANINI SOUND

BY WILLIAM H. YOUNGREN

THIS YEAR MARKS the hundredth anniversary of Arturo Toscanini's debut as a conductor, and several months ago, as if in premature celebration, Japanese RCA issued on ten compact discs (RCCD-1001/1010) some of the greatest performances from his last years with the NBC Symphony Orchestra. These are the first Toscanini compact discs, and their arrival should be an occasion for rejoicing. The compact disc provides us, at last, with a medium for permanently preserving, in the best possible sound, great musical achievements of the past like Toscanini's. Compact discs are played not with a stylus but with a laser beam, and hence there is no surface noise. Nor, if the discs are handled properly, should there be any of the rapidly accumulating wear and tear that has always been among the major disadvantages of microgroove LP records. Moreover, the digital mastering process involved in the manufacture of compact discs can reproduce the sound on an old master tape, or even on still older 78-rpm records, with a dynamic and frequency range and a freedom from distortion not attainable on ordinary LPs. While American RCA has, over the years, mishandled its rich legacy of Toscanini recordings, the Toscanini LPs issued by Japanese RCA have been of consistently high quality. (Except for one 78-rpm record, made for Brunswick in 1926, all of Toscanini's commercial recordings from 1920, when he was touring this country with the orchestra from Milan's La Scala, to 1954, when he retired from NBC, were made for Victor and RCA Victor, and are thus the property of RCA.)

But these new discs are a great disappointment. None of the twenty-two works contained on them sounds decisively better in its new format than it did in the best previously issued LP version, and most sound decidedly worse. The magnificent 1953 Beethoven *Eroica* (RCCD-1002) and 1952 Beethoven *Ninth* (RCCD-1005), the fine 1951 Brahms *First* (RCCD-1006), the transparent and witty 1952 Strauss *Till Eulenspiegel* (RCCD-1009), and several other

works are shrill and harsh in the upper range, with rather boomy bass that seems cut off from the rest of the sound because of the lack of a solid mid-range. There is little of the warmth and spaciousness that were, along with the famed Toscanini clarity of texture, an important part of the NBC Symphony sound—at least when the orchestra recorded in Carnegie Hall rather than in



NBC's notoriously dry and airless Studio 8H. The expansive 1954 Mendelssohn *Italian Symphony* (RCCD-1007), from one of Toscanini's last concerts, the grippingly dramatic 1950 Mozart *G-Minor Symphony* (RCCD-1001), the relaxed and genial 1952 Beethoven *Pastorale* (RCCD-1004), and the virtuosic 1953 Mussorgsky-Ravel *Pictures at an Exhibition* (RCCD-1009) are all considerably better—though comparison with the best LP versions demonstrates that they could have been, and hence should have been, better still. Best of all are the 1952 Beethoven *Fifth* and the 1950 Schubert *Unfinished* (both on RCCD-1003), the

1953 Dvořák *New World Symphony* (RCCD-1008), the 1951 Respighi *Fountains of Rome* (RCCD-1010), and the 1945 Mozart *Jupiter Symphony* (RCCD-1001), a fine performance marred only by a rushed slow movement.

Why should modern technological expertise, expended on master tapes that are from all reports excellent, have produced such poor results? A friend of mine—an engineer who is close to people at RCA in New York—gave me some answers. In the first place, the digital tapes required for making the compact discs were not taken directly from RCA's original thirty-inches-per-second master tapes, as they should have been. Copy tapes had to be made and sent to Japan, and although the Japanese apparently asked for ones made at thirty inches per second, they were sent ones made at fifteen inches per second. The inevitable loss in fidelity due to the slower speed was compounded by the fact that the master tapes were played, and the copy tapes recorded, on outdated equipment. Once in Japan, the copy tapes, which were analog rather than digital and which therefore had to be recopied to produce the required digital tapes, were played on machines that had either incorrect equalization or faulty head alignment—or both. The former fault would account for the badly balanced sound, and the latter would account for the fact that on several of the discs the high frequencies wobble in and out disconcertingly, producing an effect rather like the swish of a worn conventional record. Moreover, several of the discs have a low-frequency hum that could easily have been filtered out at some stage in the process without loss to the music.

What all this adds up to is a simple lack of caring, which is disappointing news but should perhaps not come as a surprise. RCA's mishandling over the years of the Toscanini recordings has been documented in scrupulous detail by B. H. Haggin in the two editions (1959 and 1979) of his book *Conversations With Toscanini*, still the best introduction to the conductor and his work.

Even before Toscanini's death, in 1957, many of his recordings—some with his approval—were beefed up with the then fashionable “enhancement” produced by running the master tape through a delay circuit, creating an echo effect that was thought to add spaciousness and depth but that added only clutter and ugliness. After his death, when stereo came in, many of his recordings

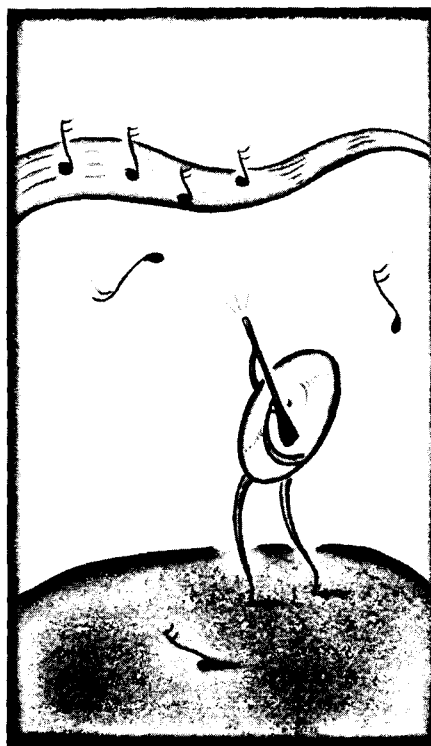
were issued in atrocious fake stereo. (Both of these practices have long been discredited, yet the recently issued RCA Gold Seal AGM1-5238, whose label proclaims it a monaural record, presents the 1950 Mozart G-Minor in fake stereo!) Even when such extreme means were not resorted to, almost every new Toscanini issue from American RCA has borne evidence of new knob-twiddling. Occasionally these misguided efforts to update the sound have produced results that are satisfactory; far more often the results have been disastrous. The best issues of the commercial recordings that Toscanini made for RCA—as opposed to the Toscanini performances that were broadcast and have subsequently been issued by smaller, “underground” labels—have come not from American RCA but from RCA in Japan, which some years ago produced a fine 100-disc set now out of print, and from RCA in Germany.

So these new compact discs are only the most recent step in a sad procession. Japanese RCA had scheduled a second batch of ten Toscanini compact discs for release late last year, but these have not appeared. Apparently, efforts are being made to improve on the first batch. American RCA has also scheduled some Toscanini compact discs for release later this year, but it is not yet known what works will be included. It would be safest to sample only a few of the best of the Japanese discs, which cost about sixteen dollars each, and then wait to see if something better turns up.

THIS LATEST BUNGLING on the part of RCA is especially regrettable because Toscanini's reputation is now in a sad state. For every music writer who has actually studied the surviving Toscanini recordings with some care, there are at least ten who are ready to assert, at the drop of a deadline, that Toscanini was, especially in his later years, a rigid and driven conductor who took everything too fast, paid little attention to expressive nuance, and sacrificed the music to his crusader's desire to play the notes exactly as the composer wrote them, with nothing added or subtracted. Thus Toscanini has become oddly associated in the public mind with the seeming rigidity and coldness of so much twentieth-century music—even though he performed no Schoenberg, Berg, Webern, Bartók, or even Mahler, and very little Stravinsky. Just as it is now fashionable to yearn for a “new romanti-

cism” in musical composition, so too is it fashionable to lament the influence of Toscanini's allegedly cold and streamlined style of interpretation on present-day conductors and to long for a return to the allegedly more expansive and expressive style of his great German and Austrian contemporaries, such as Wilhelm Furtwängler and Bruno Walter.

That this view of Toscanini is not based on his work should be immediately apparent to anyone who listens with an open mind to these new compact discs, even with their inferior sound—though better sound would have made it still more apparent. Although most of the performances come from his last few years, most of them are superbly expansive and expressive, the rushed slow movement of the Jupiter Symphony be-



ing the exception rather than the rule. This view is based, rather, on an understandable (though unjustified) suspicion that no one who was so long regarded as the world's greatest conductor by critics and colleagues alike can really have been all that great, and also on a certain ethnic and intellectual snobbery.

Furtwängler and Walter, with their rich German heritage, are assumed to have been natively cultured: Furtwängler was the son of a famous art historian and archaeologist, and he often accompanied his father on digs; Walter discussed Kant with his mentor Mahler. Toscanini, being Italian and the son of a

tailor, is seen as a sort of glorified organ-grinder, blessed with a prodigious memory and an infallible ear but devoid of the broader philosophical and historical knowledge thought necessary to a well-rounded interpretative artist. But as any reader of Harvey Sachs's excellent 1978 biography can discover for himself, Toscanini, for whatever it is worth, was an immensely cultured man. As he shunned all publicity, so he did not flaunt his cultural knowledge, quite rightly thinking that only his musical competence was of public concern.

Moreover, Toscanini's way of making music was stunningly clear and immediate and viscerally satisfying, whether he was conducting a Beethoven or Mozart symphony, an opera by Verdi or Wagner, or a popular piece like Hérold's *Zampa* Overture or Sousa's *Stars and Stripes Forever*. The same critics who allow the cultural pretensions and pontifications of other conductors to shape their judgment of those conductors' performances are all too ready to suspect that Toscanini's performances, by virtue of their very textural and gestural clarity and the obvious sense they make of the music, must be somehow superficial, not quite profound or serious enough, not alive to the deeper meanings supposedly probed by Furtwängler or Walter, or even by lesser conductors with the correct cultural pedigree, such as Otto Klemperer and Hans Knappertsbusch.

SINCE AMERICAN RCA has allowed most of Toscanini's recordings to go out of print and has frequently distorted the sound of most of those that it has retained in print, it is fortunate that the listener who wants to learn why Toscanini was so long held in such high esteem can turn elsewhere. Many of the excellent German RCA issues are still available, from German News Company, Inc., 220 East 86th Street, New York, New York 10028. And the Franklin Mint has issued a six-volume, thirty-disc set, taking special pains to get back to the sound of the original RCA master tapes. Inquiries concerning this set should be addressed to the Franklin Mint Record Society, Franklin Center, Pennsylvania 19091. Also, several smaller labels, most of them foreign, have been active in making selections from Toscanini's broadcast concerts available. Many of these records contain performances of works that Toscanini recorded commercially for RCA which are superior to the RCA versions, others contain perfor-

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manances of works that he never recorded commercially, and still others contain lengthy sections of his rehearsals.

The Italian Melodram label has issued a Brahms set (MEL 229) that contains Toscanini's finest performance of the Brahms First, taken from a 1940 broadcast. Also from 1940 are great performances of Verdi's *Requiem* and Beethoven's *Missa Solemnis* (MEL 006), which are not only generally better than the later, commercially issued ones but which also feature the glorious tenor voice of Jussi Bjoerling, then in his prime. Finally, there is the 1937 Salzburg Festival performance of Wagner's *Die Meistersinger* (MEL 012), which is of vital importance, despite its poor sound, because it is our only Toscanini recording of a complete Wagner opera.

The English dell'Arte label offers a sampling of Toscanini's enlivening performances of such popular favorites as the *Zampa*, *Hänsel und Gretel*, and *Oberon* overtures and the suite from *Carmen* (DA 9010), a section from Act III of *Boris Godunov* (DA 9011) that gives us our only idea of what his famous performances of that opera may have been like, and some very interesting 1938 performances with the Hague Philharmonic Orchestra (DA 9007).

Obtainable on the Swiss Relief label are rehearsals of Mozart's *Haffner* Symphony (RL 831) and Verdi's *La Traviata* (RL 812); a 1933 Beethoven Fifth and a 1936 Beethoven Fourth (RL 821), both done with the New York Philharmonic and perhaps Toscanini's greatest performances of these familiar works; and three Mozart works that he never recorded commercially: the Prague Symphony, the *Figaro* Overture, and the charming early symphony K. 201 (RL 841). The rehearsals are fascinating not only in themselves, as evidence of how Toscanini actually put a performance together, but also as a much needed corrective to the familiar stories about his rages. Most of the time, he worked at rehearsals with great patience and efficiency; the famous blowups, like the occasional rigid and driven performances, were the exception rather than the rule. The New York Philharmonic recordings are important because this was Toscanini's greatest orchestra, because he made few commercial recordings with it, and because those few are now mostly out of print.

The Melodram, dell'Arte, and Relief records are all obtainable from German News. New York's other principal record

importer, IBR Classics, 40-11 24th Street, Long Island City, New York 11101, can provide several Toscanini releases on the Italian Fonit-Cetra label. The most important of these is a set (DOC 52) containing the four Brahms symphonies and his Haydn Variations and *Tragic Overture*, performed with the Philharmonia Orchestra during Toscanini's last visit to London, in 1952. Also of interest are a Wagner set (DOC 17) and records of selections by Debussy (DOC 18) and Gershwin (ARK 4).

Finally, there are a number of records that may be obtained from Music and Arts Programs of America, Inc., P.O. Box 771, Berkeley, California 94701. These include 1939 performances of Beethoven's First, Second, and Fourth Symphonies (3011), all of which are superior to the later, commercially issued ones; the Mendelssohn Scotch Symphony (3004) and the Schubert and Schumann Second Symphonies (3003), none of which Toscanini recorded commercially; a 1938 Beethoven Ninth (3007) that is even more splendid than his commercially issued version; a Wagner set (3002); and a set that contains his greatest performance, from 1939, of Schubert's Unfinished, together with his spectacular 1945 final concert with the New York Philharmonic (3009), especially notable for an incandescent performance of Haydn's Symphony No. 101.

On all of these recordings one can hear, despite their sometimes less than adequate sound, the precision of attack, sensitivity of nuance, plastic shaping of phrase, and subtle feeling for continuity of impulse that made Toscanini precisely what he was once claimed to be: the greatest conductor of our century. One puts up with the inadequate sound because these are not studio recordings, professionally prepared for commercial release, but derive from tapes or acetate discs made by private collectors as the broadcasts came over the air. I hope that my animadversions on the sound of the Japanese RCA compact discs, and on American RCA's treatment of Toscanini's recordings, have not suggested that what is now called "sonics" is more important than music. Obviously, no one who is looking for state-of-the-art sonics should buy a Toscanini recording. However, RCA has no excuse for not making the extraordinary cultural documents in its possession available to interested listeners in the best sound that its state-of-the-art equipment can produce. □

DANCE

SWING STORY

BY ROBERT P. CREASE

ONE DAY TWO years ago, in the back room of a Stockholm wrestling club, a sixty-four-year-old black American jazz dancer named Albert Minns showed a Swedish television crew a clip from the 1941 movie *Hellzapoppin'*, in which Minns had performed. In it he whips his partner twice around in a circle, picks her up, throws her over his back, and whirls around with one leg straight out while she crouches underneath. He begins a cartwheel; she grabs him while he is upside down and lifts him up and shakes him; then, with his legs still in midair, she drags him off-stage. Minns explained that this sequence—only twenty-five seconds long, and employing no doubles or fancy camera tricks—is a typical example of a dance called the Lindy Hop, a savagely energetic improvisational dance that arose in Harlem in the 1920s. Sometimes referred to as America's one true folk dance, the Lindy Hop is the most frenzied, exciting, and controversial social dance that the United States has ever seen.

Minns's arrival in Stockholm to give lessons in the Lindy Hop had been something of an event. His classes were reported in newspapers and over the radio. One was filmed for the television variety show *Razzel*, the most popular program in Sweden. It was then that Minns showed the clip from *Hellzapoppin'*. Even as he spoke, a group of dance students gathered in another room of the wrestling club for their daily practice session. Some, on wrestling mats, flipped their partners over their backs; others lifted weights or did tumbling exercises. How had a black American jazz dancer come to be teaching in a Swedish wrestling club? the television interviewer wanted to know. Minns drew a deep breath and slowly shook his head. "That," he said, "is the wildest story."

JAZZ DANCE is an American concoction that developed after the turn of the century. Just as jazz music was the offspring of the musical miscegenation of West African rhythms and European harmonies, jazz dance was the blending

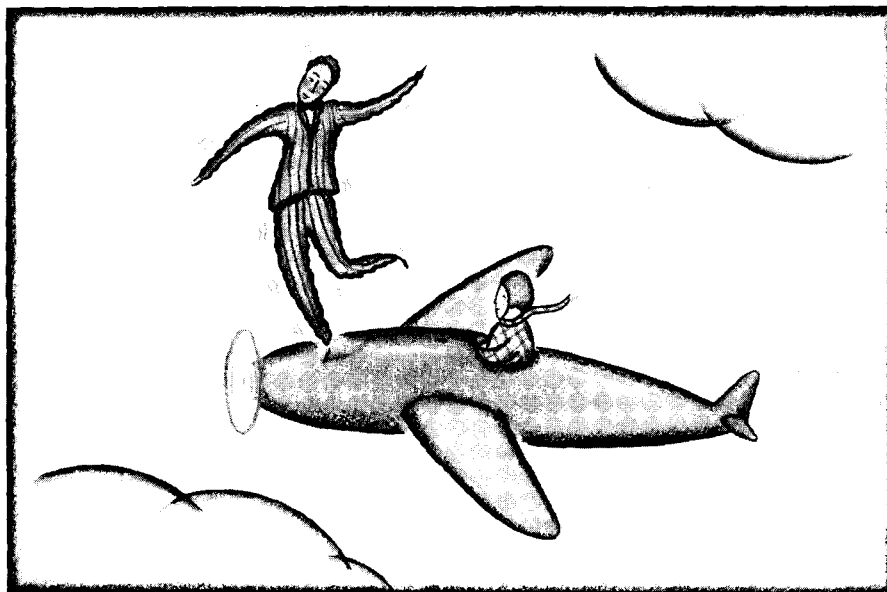
of West African body movements and European steps. As in African dances, the body motion is largely improvisational and centered in the hips; as in European dances, recurring footwork binds the motions into a sequence. Harlem was a center for jazz dance in the 1920s, and in its nightclubs one could see a number of jazz steps with such suggestive names as the Black Bottom, the Fishtail, the Shimmy, and Snake Hips.

Soon, however, the greatest of them all evolved: the Lindy Hop. A couple would begin the dance with deceptive sobriety, embracing each other ballroom-style. Then, whenever he pleased, the man would suddenly fling his partner away and improvise. (These "solo hops" caused the dance to be named for Charles Lindbergh, who had flown across the Atlantic alone in May of 1927.) A dancer doing the Lindy could be wildly expressive yet still experience the delights of give-and-take with a partner. The Lindy also had an extended rhythm—its basic dance phrase consisted of eight counts rather than the usual four—with plenty of leeway to incorporate elaborate twirls, flips, and all the other jazz steps, including the Charleston. The dancing became hotter still

with the arrival of the swing style of big-band music, in the mid-thirties; the swing sound developed when bands substituted bass and guitar for tuba and banjo in their rhythm sections. (The term *swing* soon spread from the music to the dance. Today dance studios use *swing*, *Lindy*, and *jitterbug* synonymously, although dance connoisseurs make distinctions among them, considering *swing dancing* to be the whole genre and *jitterbugging* to refer to a bouncy, six-count variant of Lindying.) Swing's faster, more pulsating beat drove Lindy Hoppers to still further frenzies, and to be on the dance floor during a swing number was to be in the middle of a thunderstorm of activity, the dancers crazy with life, their energy discharging into form after form. Malcolm X said in his *Autobiography* that it was the Lindy that first awakened in him his long-suppressed African instincts. Here he is dancing with his partner, Laura, at the Roseland State Ballroom, in Boston:

The spotlight was working mostly just us. I caught glimpses of the four or five other couples, the girls jungle-strong, animal-like, bucking and charging. But little Laura inspired me to drive to new heights. Her hair was all over her face, it was running sweat, and I couldn't believe her strength. The crowd was shouting and stomping. A new favorite was being discovered; there was a wall of noise around us. I felt her weakening, she was lindying like a fighter out on her feet, and we stumbled off to the sidelines.

The scene at Roseland was "small and shabby," Malcolm X wrote, compared



with what he later found at the Savoy, Harlem's elegant citadel of Lindy dancing, on Lenox Avenue between 140th Street and 141st. The Savoy's 200-foot-long, hardwood dance floor had to be replaced every three years—it just wore out under the constant pounding. Two and sometimes three orchestras appeared nightly. Among the wildest dancers was the young Albert Minns.

For Minns, the Savoy was a second home. He would go after school, do his homework there, practice dance steps, go home for dinner, and return. One evening a little over a year ago Minns took me to where the Savoy used to stand. In its place was a huge housing project and a Woolworth's, whose metal security gates were covered with graffiti. Music blared from a radio, and a crowd of teenagers stood on the corner, eyeing in silence the elderly, neatly dressed black man and his nervous white companion. But Minns was oblivious of all that; the only reality for him was the memory of what had been the one truly happy period in his life.

"It was a *beautiful* place," he said. "Black people and white people and, oh! everyone dressed in suits and furs. You had to act like you had *class*. No loud talking and no cursing, or they'd throw you out. You kept your jacket on, and by the end of the evening your jacket would be black with sweat."

The Savoy held a dance contest every Saturday night, and Minns won his first in 1937, at the age of seventeen. Winning earned him admission to the Cats' Corner, the northeast section of the Savoy dance floor. There Minns and other members of the elect improvised new steps for the Lindy rhythm. Minns told me, "I haven't seen nothin' the break dancers do that we didn't do in the Savoy in the 1930s—except maybe spin on our heads."

In 1938 Minns achieved the pinnacle of celebrity by winning the Lindy contest at the Harvest Moon Ball, a dance competition sponsored by *The Daily News*. He went on to dance at the Cotton Club, which by this time had moved downtown from Harlem to the Times Square area. Minns was still an amateur dancer with no professional training whatsoever; nevertheless, he was asked to tour with bands and do bit parts in a series of stage shows, including *Hellzapoppin'* (1938, three years before the movie version), *Knickerbocker Holiday* (1938), and a jazzed-up Gilbert and Sullivan production, *Hot Mikado* (1939).

EVERY SO OFTEN a popular dance form will prompt the sentinels of high culture to proclaim the downward slide of civilization, the decay of social ties, and a return to primitivism. Some Austrians at the end of the eighteenth century, for instance, saw in the waltz a primary cause of the younger generation's spiritual weakness. A century later the tango, the steamy, erotic invention of the barrooms and brothels of Buenos Aires, was banished from polite society for a time even in Brazil. Both of these dances originated in the lowest sectors of society and involved sensuous movements. Moreover, their popularity threatened to bring different social classes into intimate contact: an aristocratic girl might be literally swept off her feet by a longshoreman. Later, suitably cleaned up, both dances became symbols of elegance in the ballroom.

The Lindy was the dangerous dance in the America of the thirties, and it was all the more disturbing because it mixed races as well as classes. Blacks and whites mingled in dance halls and nightclubs called black-and-tan clubs, where the Lindy reigned.

According to an article by the Associated Press wire service, Dr. John J. Lalli, of the Philadelphia College of Osteopathy, deemed the Lindy a throwback to "the war and religious dances of primitive tribes." An anxious reader of *Hygeia*, a magazine of the American Medical Association, wrote to inquire whether Lindy Hopping led to sexual perversion. *Hygeia* replied that the dance could "be compared to the waves of mass hysteria known as dancing manias which swept over Europe in the Middle Ages," and that it was an "escape mechanism" from "harsh realities, such as unemployment, financial stringency, political confusion, and personal bewilderment."

Particularly threatened were professional dance teachers, who had charged themselves with responsibility for bringing culture and elegance to social dancing. Naturally, this was directly challenged by the Lindy's sometimes violent, sometimes erotic movements. Furthermore, because the Lindy was improvisational, it couldn't really be taught. While the Lindy was spreading nationwide, various associations of dance teachers began to mount efforts to discredit it.

In 1939 the Dancing Masters of America recruited Irene Castle, the doyenne of American ballroom dancing, to deliv-

er a broadside at their annual convention. "Jitterbug dancing is neither graceful nor beautiful," she proclaimed. "One should float to the music." Meanwhile, the Dancing Teachers Business Association warned that Lindy dancing was "a form of hysteria that will prove harmful to the poise of the present generation."

But the call to float to the music and the warnings of the potential for poor posture fell on deaf ears. Celebrities such as Marlene Dietrich, Greta Garbo, and Lana Turner began to visit the Savoy; Turner is said to have given the Savoy its nickname "The Home of Happy Feet." In the fall of 1943 the New York Society of Teachers of Dancing, Inc., became one of the first associations of instructors to face reality and recognize the "Lindy-Jitterbug" as an official American dance. They would bring the dance "under professional control"—which meant, they explained, that they would teach it *sans* the wild steps that were an affront to nice dancing. No head jerks, no hip thrusts, no air steps, would destabilize their ballrooms.

Just when the Lindy had finally "passed"—made the transition to white society—Harlem began to decline as an entertainment capital. A recording ban and a 20 percent entertainment tax imposed to support the war effort dealt a heavy blow to the dance halls and clubs that were Harlem's major source of income. In 1943 New York City's mayor, Fiorello LaGuardia, closed the Savoy for a short period—to stop blacks from dancing with white women, said Harlem's leaders. In August of that year the shooting of a black soldier by a white policeman sparked a riot, and with the subsequent police crackdown Harlem's night life hit rock bottom.

Minns, meanwhile, served with a detached regiment in Europe, where he entertained black troops in a revue called the Harlem Express. "When I left Harlem," he said, "it was jumping. When I came back, it was limping. The streets looked like *they* had been in the war. Many of my friends had moved out."

Thereafter the Lindy persisted only in the lifeless form taught by the professionals. Recently I took a Lindy lesson at a Fred Astaire Dance Studio in New York City. "The Lindy is great for dancing to top-forty music!" the pert young instructress told me after showing me a sanitized and virtually unrecognizable step. "It's *perfect* for *Billie Jean*!"

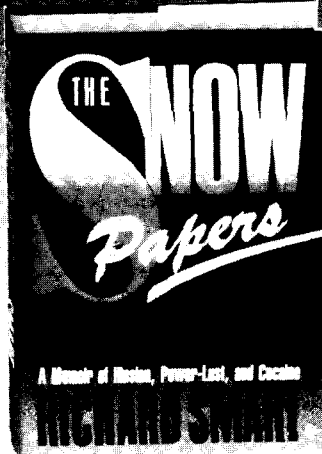
SPONTANEOUS and deeply individualistic, the Lindy is the ultimate American dance. For this reason it was slow to catch on abroad. The Continent somehow just didn't suit swing, observed the veteran *New York Times* European correspondent Frederick Birchall, in 1939: "Away from home it becomes pallid and anemic," he wrote. Birchall lamented the absence of "real alligators, jitterbugs or hepcats truckin' the king-kong, shagging or doing the jeepers in an Italian ballroom. They do like their dance tunes soppy and have no idea of anything 'wacky.'"

The Germans, at least, took the Lindy seriously; the Nazis recognized a threat to civilization when they saw one. The Lindy was banned in many cities, and nightclub owners were instructed to expel swinging couples. Hitler's Elite Guard, smarting from victories by American blacks over Aryan athletes at the 1936 Olympics in Berlin, published photographs the following year of black Lindy Hoppers which purported to prove the impossibility of civilizing blacks and the concomitant fraudulence of American ambitions to achieve racial equality. The Guard's official newspaper, the *Black Corps*, commented, "On the one hand, equality of all men; on the other, the Lindy Hop—a mixture of cannibalistic abdominal contortions and obscenity. Such a reckoning simply does not balance."

Amazingly, the Lindy met with the greatest enthusiasm—as well as with a proportional amount of outrage—in Sweden. Who would have thought that this ethnically homogeneous country, which had only recently gone from agrarianism to industrialization, and whose rigidly hierarchical society and culture were dominated by the Germans, would prove to be fertile terrain for jazz? Nevertheless, as early as the 1920s Sweden had jazz nightclubs and jazz radio programs. By the 1930s it had a full-fledged jazz culture, including one of the world's first jazz magazines (*Orkester Journalen*, founded in 1933), top-flight musicians, and its own jazz slang: a *snilla* was a woman, a *snork* was a trumpet, and a *negerben* ("Negro's leg") was a clarinet. American bands made Stockholm a regular stop on European tours. Louis Armstrong visited in 1933 and Jimmie Lunceford in 1937. When Duke Ellington celebrated his fortieth birthday there, in 1939, the occasion was virtually a city-wide holiday.

Swedes likened the Lindy to their

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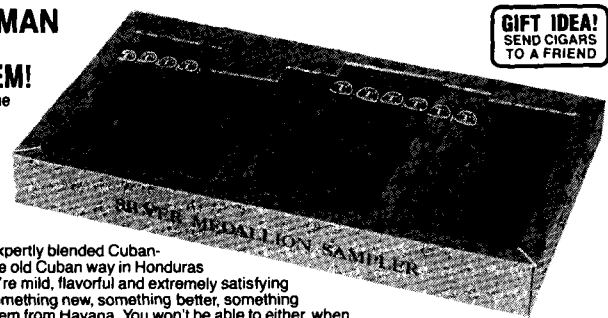
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own Hambo, an improvisational, fast-paced folk dance; the Lindy quickly became known as the American Hambo. Stockholm's swing citadel was the National Palatset, or "Nalen," on Regeringsgatan, near the center of town. Nalen had a large dance floor and two orchestras each night; its walls were decorated with portraits of black American jazz greats, bare-breasted African women, and fanciful Harlem street scenes—Harlem as Oz, a magical place with clean streets where life was a party twenty-four hours a day. In a smaller, adjacent room, named Harlem, jazz musicians performed for listening only; on a typical night the audience might include Greta Garbo and the young Olof Palme, later to become prime minister. With dance competitions every Saturday night, Nalen was Stockholm's Savoy—and in it the Lindy was king.

Swedish church and government authorities and community leaders attacked jazz savagely. Magazine articles demanded the deportation of jazz musicians. A priest in Växjö reviled jazz dancing as "negroid mating rites"; another, in Sigtuna, described it as "a refined means of masturbation." In Stockholm the pastor of the Katarina church called Nalen a "den of iniquity" and the activity there "Satanic fool's play." One preacher actually entered Nalen and, between sets, delivered a fire-and-brimstone sermon against dancing.

On September 28, 1941, when Nazi panzers had overrun Allied positions all over Europe and many clergymen in other lands were risking their lives for the Resistance, the Swedish Council of Churches launched an extensive investi-

gation into the declining morals of Swedish youth. Part of this investigation concerned the *Dansbane-eländet*, or the "Dance-Hall Calamity."

Questionnaires about the effects of dancing on youth were sent out to every parish priest, every doctor employed by the state, 1,700 teachers, and numerous social workers. According to the preliminary returns, these community leaders felt that the new dances led to uncivil behavior, immorality, drunkenness, free love, venereal disease, and abortions. The respondents did not view dancing as a morally neutral activity that happened to have undesirable side effects; they considered dancing itself to be a poison.

On a recent visit to Stockholm I asked Jonas Frykman, a sociologist at the University of Lund who has studied the Dance-Hall Calamity, why the dance halls had provoked such a violent reaction. "Prior to the 1930s," Frykman said, "there was no real youth culture in Sweden. Children of the rich attended German-style schools, shunned dance halls, and listened to Wagner. Priests, teachers, and doctors were the only ones who crossed class lines. Suddenly all that changed. In dance halls, for the first time, youths of all classes came into contact with each other, and with other cultures. Not surprisingly, their elders viewed these dance halls as a threat to the social order, and community leaders of the 1940s spoke of the Dance-Hall Calamity the way community leaders of the 1950s spoke of juvenile delinquency. In a sense, it was a classic bourgeois mentality—to view every kind of ecstasy, and bridging of social classes, as a

threat. But in Sweden this was taken to incredible extremes. If you read the police blotters of the time, you find an astounding paranoia about dance. Nalen was raided repeatedly, and undercover police would enter jitterbug contests, then throw off their disguises and arrest people."

Frykman paused a moment. "You know, Sweden is a most *exotic* country," he said. "The more I study Swedish culture, the more exotic it seems."

Eventually the uproar abated. The church council's final report on the Dance-Hall Calamity, issued in 1945, concluded that young people should be encouraged to find better uses for their time—but also that there was no cause for alarm. That same year Sweden's most famous newscaster, Gunnar Skoglund, visited Nalen and reassured parents that the American Hambo was healthful; with all the energy it takes to do the dance, he said, "it's constitutionally impossible to think about sex." (I have it on the authority of Albert Minns that this statement, however well-intentioned, is erroneous.)

By the end of the 1940s Sweden, too, had tamed the Lindy. Professional instructors were teaching a dull version that came to be called the *ute-bugg*, roughly translatable as "the jitterbug that you do when you go out someplace." Nalen fell on hard times. It is now a church-run rehabilitation center for alcoholics—a different end from that of the Savoy, but no less desolate. When I visited the place, I was served coffee in the room once called Harlem. In the ballroom a soft carpet covered the floor, and the bare-breasted African women and Harlem street scenes had been painted over. One bandshell had been removed; the other was miked for a choir, and over it was suspended a huge white cross.

AFTER THE WAR Minns concluded that his dance career was over. There was no longer a market for performing or teaching his craft; swing was giving way to bebop, for listeners only. In 1947 an expatriate Russian modern dancer, Mura Dehn, sought out Minns, who was then working in a paint factory. Dehn, the widow of the American painter Adolf Dehn, loved the Lindy and had gone to the Savoy regularly after her arrival in this country, in 1930. She arranged for Minns and a few other black jazz dancers to give performances; the first one took place in a Manhattan art gal-

lery. A few years later Marshall Stearns, a white authority on jazz music and dance, asked Minns to perform to illustrate his lectures; he also put Minns in the Newport Jazz Festival. These occasional appearances were well and good, but Minns missed the social dancing he had done at the Savoy in the thirties, and he was barely able to support himself with menial jobs. Furthermore, he was embittered by the fact that younger blacks viewed his generation of black entertainers as Uncle Toms, content with bit parts while whites held the lead roles (Minns played a busboy in *Hellzapoppin'*, for example). Minns couldn't interest the kids in his Queens neighborhood in the Lindy. "We don't want to learn that old stuff," they said. He began to drink heavily. When Stearns died, in 1966, Minns's opportunities for concert appearances became still rarer. As a final setback, he was attacked by muggers outside his home and the beating left him legally blind.

In 1981 Minns attended a reunion of Savoy dancers thrown by Mama Lou Parks, an old Lindy Hopper. There Minns was spotted by Larry Schulz, a jazz enthusiast and a news writer for a television station in New York City. "I learned more about swing from watching Al that one night than I did from twenty years of listening to records," Schulz recalls. Immediately Schulz began to arrange for Minns to audition for the movie *The Cotton Club* and the Broadway show *My One and Only*. But Minns failed when he had to act professionally for the first time in his life, at the age of sixty-two. Like a child, he had to be coaxed to perform. He stumbled over his lines; out of vanity he refused to wear the thick glasses he had needed since the mugging. After the audition for *My One and Only*, Schulz took Minns out for coffee: Minns was trembling so much he couldn't hold his cup. He was rejected for every part he tried out for.

Schulz finally persuaded Minns to teach at the dance studio run by his wife, Sandra Cameron, a three-time United States Professional Ballroom Champion in International Style—which is where I met him. His classes were disorganized, and he usually reeked of whiskey. But he had infinite patience with us, and our wooden hips, and our altogether rudimentary sense of intricate jazz rhythms. He didn't seem to care that all of his students were white. There were moments when a look suddenly came over his face and he forgot us

completely, as he threw himself into the kind of dancing he loved, agile and limber as a teenager. For his students this was pure magic.

At Cameron's studio Minns began to acquire students from outside New York City. One of these was Erin Stevens, the head of the Pasadena Ballroom Dance Association, of California. Stevens had grown tired of the country variant of the jitterbug called Westcoast Swing, popular in the West and the Midwest. Much more restrained than the Lindy, Westcoast Swing is sometimes called slot dancing, because the man stands in one place and passes the woman back and forth to either side as if she were in a slot. (The U.S. Open Swing Dance Championship, which is held in Anaheim every November, is for Westcoast Swing dancers, its name notwithstanding.) In movies like *Hellzapoppin'*, Stevens had seen what she calls traditional American-style swing, and she enrolled in Minns's class to learn to dance like that. "I knew most of the steps from the films," she says, "but Al taught me how to give them the right energy, how to dance my heart out."

Minns's efforts to teach the old Lindy style were given a boost in February of 1984, when an old Harlem landmark, Small's Paradise, began to hold Monday-night dances to big-band music. Minns and his devoted coterie of white students became regulars. They were able to see other Lindy Hoppers from the Savoy, such as Frank Manning, who had choreographed the *Hellzapoppin'* dance sequence, and Norma Miller, one of Minns's partners from the old days. When Minns met Cotton Club chorus girls and musicians with whom he had worked fifty years before, I sometimes saw him moved to tears.

IN 1977 LASSE KUHLE, a dance teacher and choreographer who could be described as the Bob Fosse of Sweden, started a class in the original Lindy. Kuhler had learned the dance at Nalen in the 1950s. His first crop of Lindy Hoppers quickly absorbed all he could teach them. Spurning the *ute-bugg*, which they snidely called the Swedish walk, they set out to recover more of the 1930s American Lindy style. With Scandinavian thoroughness they rented a dance hall, in which they played recordings of American big-band jazz, and they persuaded a local wrestling club to let them use a room for practice during off-hours in exchange for Lindy exhibitions

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between wrestling bouts. They founded a two-week Lindy summer camp. They began to collect film clips of the Lindy and religiously watched every American musical-comedy film of the thirties that came to Stockholm, hoping for a Lindy scene. And they decided to form an amateur club, the Swedish Swing Society.

One night two of the club's members, Anders Lind and Lennart Westerlund, went to see *Hellzapoppin'*, which was playing at an old theater in Stockholm. It changed their lives. Anders told me, "When we came out of that movie, it was pouring rain, and all we could do was stand in front of the theater and shout at each other, 'Did you see *that*?' 'Did you see what he did *then*?' We stood there for an hour, sheltered by the marquee, screaming at each other about that dance sequence." Obviously, they concluded, they would have to find Albert Minns. In June of 1984 Lind, Westerlund, and another member of the club, Henning Sörensen, left for New York City.

It took the Swedes just three days to find Minns. On June 7 they went to a midtown nightclub to attend a memorial dance for Count Basie, who had died six weeks before. Among the dancers they noticed one in particular who looked familiar and whose motions were especially elegant. They stood and watched.

"I was dancing, minding my own business," Minns said, "when I saw these three *Vikings* staring at me. I grabbed my partner and we danced over to the side. There they were again! I thought it must be the FBI or something." The Swedes introduced themselves and then for several weeks proceeded to dog Minns's steps. They tracked him to Cameron's studio, where they interviewed him for hours. They met him at Small's. Every time he turned around, there they were. When the Swedes left, they told Minns that they would see him again. In August he received a plane ticket in the mail; in September he went to Stockholm.

MONTHS BEFORE THE Swedish Swing Society sought Minns out, it had discovered that the Dance-Hall Calamity had never really ended. This fact began to dawn on the society when it attempted to register with the organization administering government funds for amateur dance groups, the Svenska Danssportförbundet (DSF). Although

supposedly an amateur organization, the DSF is a stronghold of professional dance teachers—half of the present board members are professionals.

As the society quickly learned, the DSF was not interested in administering the Lindy. In late 1983 the society, together with several other Swedish amateur dance clubs that were interested in Swedish folk dance, ballet, dancing for the handicapped, and so forth, petitioned the DSF at its annual convention to administer any dance club that asked to be included. When they were rebuffed, they formed an unregistered rival organization, the Svenska Amator Dansförbundet (SAD). The SAD decided to try to elect some of its members to the board of the DSF at its next annual meeting. When the DSF found out, there followed a series of maneuvers worthy of fifteenth-century Venetian politics. Voting at the DSF meeting is by clubs, with each club having one vote no matter how many members it has. Suddenly, dozens of amateur ballroom-dance clubs sprang up, each with a handful of members and "advised" by a professional dance teacher.

The showdown took place on September 23, 1984, at a high school auditorium in Stockholm. The president of the DSF, Hans Frennensen, expressed his "great pleasure" at the new interest in dancing reflected by all the new clubs. A stormy meeting ensued at which the DSF refused once again to administer the Lindy. Frennensen argued that there simply weren't enough resources to administer all the dances people were interested in; "We can't teach dancing football players!" he said. John Christopher, a DSF member and an international skating judge, who was wearing his skating medals on his chest, told me during a recess in the meeting, "Many of us want to make ballroom dance an Olympic sport. But you can't make an Olympic sport out of the Lindy Hop—it's so disorganized, it's hardly a dance at all! Admitting it could seriously hurt our chances at the Olympics."

The swing dancers and their allies got nowhere. After the meeting I asked Henning Sörensen what the defeat meant for the Swing Society. "I think everything now goes to hell," he said. "But at least hell is a fitting place to Lindy."

Four days after the DSF meeting Minns arrived in Stockholm. "I felt like a raisin in a bowl of milk," he said later. But he was appreciated in Sweden as he

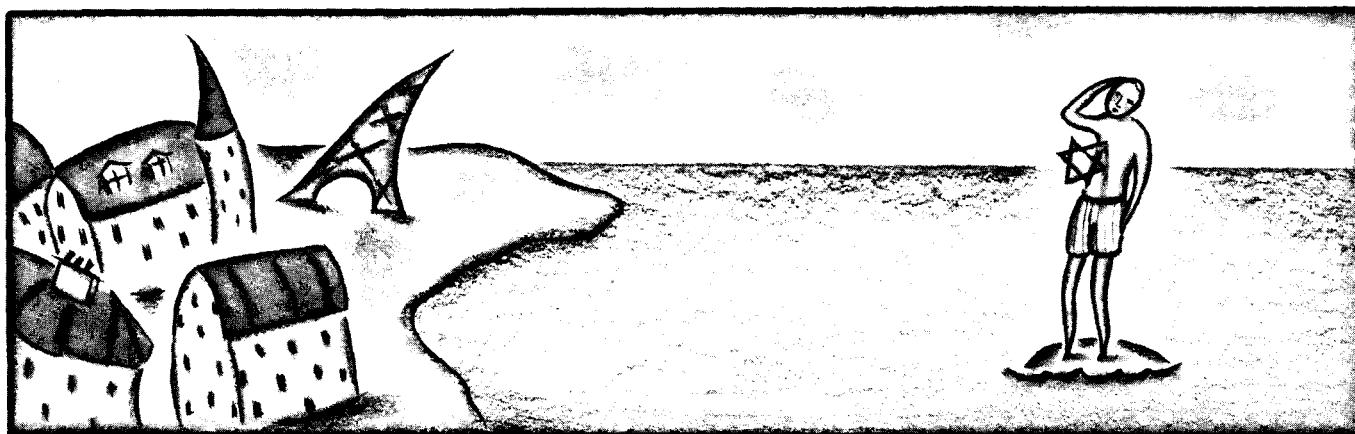
never had been in the land of his birth.

Despite its tiny budget the Swedish Swing Society gave Minns money, housing, and tours of the country. In exchange he taught several hours a day, five days a week. He gave up drinking. His classes were touted on the radio and in newspapers, and they attracted hundreds of people—from the ages of six to eighty, from beginners to couples doing the most dangerous flips. ("They do *warm-ups* before class!" Minns told me, incredulously.) He appeared on *Razzel*, accompanied by his students. Smiling and happy, oblivious of his sweating apprentices behind him, Minns danced as if the entire sixty-four years of his life had been nothing but joy. For a few weeks it began to feel to Minns like the thirties again.

WHEN MINNS RETURNED to the United States, in early November, he found that his students, including me, had formed the New York Swing Dance Society, then patterned on the Swedish example. Minns was delighted, and at the first anniversary party for the revival of big-band dancing at Small's, on February 11, 1985, he watched one of his students, Margaret Batiuchok, a founder of the fledgling group, win the Lindy contest. Before he left that night, he danced a slow, bluesy Lindy with another of his students. It was Al Minns's last dance. The next morning he awoke with a painful burning in his chest; later that day, at Queens General Hospital, he was diagnosed as having pneumonia and sent home with an antibiotic. Two weeks later, frail and trembling, he was back in the hospital. This time the legacy of years of heavy drinking was found in his esophagus—a large, inoperable tumor.

On April 25 Albert Minns died. A memorial service was held at a rundown chapel in Sugar Hill, once Harlem's finest neighborhood. On the walls black and white angels frolicked together. A pale blue sky dotted with clouds was painted on the ceiling above Al's coffin; he was in heaven. On each side of the dais was a stand of flowers, one from the Swedish Swing Society, the other from the New York Swing Dance Society. To make myself believe he was really dead, I touched his cheek. It was stony and cold. The spirit had left him, passed along to his students—in New York, California, Stockholm, and elsewhere—in the form of a little wildness they had learned to put into their dancing. □

BOOKS



THE PRISONER OF DEVIL'S ISLAND

BY ALISTAIR HORNE

THE AFFAIR: THE CASE OF
ALFRED DREYFUS
by Jean Denis Bredin,
translated by Jeffrey Mehlman.
George Braziller, \$24.95.

BEFORE THE DECADE is up, the world will be reminded of the hundredth anniversary of Alfred Dreyfus's deportation to Devil's Island—a day of shame not only in the history of France. The further one stands back in time from the Dreyfus Affair, the more it seems to sit perched on a special pinnacle of collective madness all its own; and yet, when one examines the passions it unleashed, one becomes rather less surprised that Europe's greatest mass madness of all, 1914, lay just a few years ahead.

In broad outline the whole sordid story of the Dreyfus Affair has been told and retold so often that few can be totally unfamiliar with it. But the details of its plot and subplots are necessary here. Alfred Dreyfus was a thirty-five-year-old French artillery captain, of a moderately prosperous Jewish family, but born in Alsace, one of the two provinces of France seized by Germany in 1871, when Dreyfus was still a child. Though he seemed never to have been "comfortable" among his fellow officers, Dreyfus, in common with many Alsacians, was passionately attached to France, and it was his dedication to *la revanche* that led him to join the army.

In October, 1894, Dreyfus was con-

fronted by a fellow officer, on the orders of the chief of the French General Staff, with a *bordereau*—a memorandum—filched from the wastepaper basket of the German military attaché and alleged to have been written in Dreyfus's hand. The deadly *bordereau* contained some (fairly low-grade) intelligence about the firing mechanism of the latest French cannon. Dreyfus protested to the end of his life that it was a forgery. Nevertheless, no one believed his innocence, and after a mockery of a trial he was subjected to the most humiliating degradation—stripped of his uniform in front of troops arrayed on the parade ground of Paris's Ecole Militaire—and then, on February 22, 1895, deported to the lethal Devil's Island, sentenced to life for espionage.

Terrible years went by before Colonel Picquart, the good fairy of the story, discovered that the *bordereau* was in fact a forgery and that the guilty spy was an unsavory captain of Hungarian descent called Esterhazy, a man of many mistresses and debts. Despite Picquart's powerful evidence, the French General Staff—closing ranks to conceal its previous blunder—refused to accept it, and Picquart himself was submitted to disgrace and given a jail sentence. (Esterhazy eventually fled to England, where he died under an assumed name many years later.) Because of the French military establishment's determination to hush the scandal up, still more years went by, until Emile Zola's potent and immortal article "J'accuse" whipped up such powerful public emotion as to make a retrial unavoidable—though Zola, too, went to prison for his pains.

There followed the suicide of Colonel Henry, Dreyfus's accuser, the dubious

protector of the French army's honor—and its fall guy. Then came the Rennes retrial, in 1899, and finally the reversal of the sentence and the rehabilitation of Dreyfus—but not until 1906.

These were twelve years that tore French society apart to the most appalling extent, re-opening all the cicatrices that had been healing since the crushing defeat in 1870 at German hands, followed by the bloody civil war of 1871, unleashed by the Paris commune. They also exposed some new wounds, such as the gangrenous sore of anti-Semitism, and left many over which even today only the skin has closed.

This has long been one of the most unpalatable stories of French history. It still poses many mysteries. For instance, why did Dreyfus's superiors accept his guilt so readily and believe in it so obdurately? The cries of "Death to the Jew" during the degradation ceremony provide only part of the answer.

If the Dreyfus files need to be taken out again and dusted off, and the mysteries re-examined, there can be few better fitted to do so than Jean Denis Bredin. Although not primarily an author, he has as an eminent lawyer written a number of distinguished books on law. Holding France's highest degree in civil law, Bredin is by political persuasion a Radical. As a young man he worked with Pierre Mendès-France, the reforming Jewish Radical who was one of the most impressive leaders of the unhappy Fourth Republic. Thus Bredin has expert qualifications for re-examining the evidence (though this is not the prime importance of his endeavors), and the result is a brilliant and fascinating book—though possibly not the easiest bedside reading.

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ATLANTIC MONTHLY PRESS BOOKS



MIKA FOWLER

Some openings are irresistible, even to jaded publishers. When Salina Jane Feldman, aka "Baby," is carried over the threshold of her new husband's one-bedroom Birmingham apartment only to discover another young couple already ensconced there, playing a game of Hearts, we had to read on to find out more. What we found was a writer with a deliciously laconic tone, a perfect ear, and a devastatingly acid humor—the qualities that in 1983 won **Sandra Thompson** a Flannery O'Connor award for *Close-ups*, her collection of short fiction.

The sparseness and understatement of **Sandra Thompson's** writing have already earned her comparisons with Anne Beattie, yet her voice is unique. Padgett Powell succinctly describes **Wild Bananas** as a novel about "how we began our generation by dropping out and ended it by struggling back in, how we became lawyers and became divorced." As Carolyn See puts it, "If we're living in white-bread times that recall the fifties, the up-side of that is that once again we have the luxury of hearing an occasional voice of elegant alienation. . . . **Wild Bananas** makes the domestic nightmares of young-married America hilariously, falling-down funny."

WILD BANANAS
by Sandra Thompson

At your bookstore

Distributed by
LITTLE, BROWN AND COMPANY

Also available from the Atlantic Bookstore, page 88.

IN FIN DE SIECLE France the Affair escalated with extraordinary swiftness far beyond the simple issue of the guilt or innocence of one man. At this range it is difficult to understand the bitterness generated, in which even the highest in the land became involved. At least thirty-one duels were fought over the Affair. Both Dreyfus and his lawyer were wounded by would-be assassins. Generals and ministers of war resigned in heaps. One premier fell, and proved extremely hard to replace. There was at least one (admittedly half-cocked) attempt at a military coup. The newly elected pro-Dreyfus president of France, Emil Loubet, had his top hat cleft at a racecourse by the cane of an anti-Dreyfus baron. Under the stress of it all another president, Félix Faure, died in his office of a stroke while conducting a highly private interview—unsuitable to his years—with a lusty redhead. When Zola exploded his "bomb" in support of Dreyfus, placards saying DEATH TO THE JEWS were paraded through Paris, and the windows of Jewish shops were shattered in Nantes in scenes that now seem like a horrible preview of Hitler's Kristallnacht. It was as if some Pandora's box full of all the suppressed and most violent prejudices of the past century had suddenly been opened. Nearly a century later the box has still not been entirely locked up again.

As far as the courtroom evidence is concerned, Bredin evidently believes that few secrets remain. He resists legends, such as the existence of a third man. He notes the mystery of the cut-throat razor found closed in the hand of Colonel Henry, together with the Colonel's enigmatic last words, "You are not without knowing in whose interest I acted," which hinted that the General Staff might have put a "contract" out on Henry once he had "squealed," lending a perpetually unresolved Simenonesque dimension to the whole Affair. Nevertheless, Bredin is categorical that "suicide remains the only convincing verdict." Yet General Weygand, who would be the leader in the debacle of 1940, and other French officers still believed Dreyfus to be guilty, and I know at least one British author who privately hopes that one day he will be conclusively proved to have been. After reading Bredin, however, one finds it hard to believe that such hopes will ever be fulfilled.

In an appallingly tragic tale Bredin brings to light episodes that—were it not all so deadly serious—would read al-

most like a Feydeau farce: the cleaning-woman secret agent, Madame Bastian, ransacking the wastepaper basket of the German military attaché and then handing over its contents to French intelligence officers in a deserted church; the owner of the basket writing (in those rapturous pre-AIDS days) to his opposite number, the Italian military attaché, "Alexandrine—when will you come to bugger me?"; the forging and counter-forging and the intercepted letters; and the dreadful commandant with the name that sounds like something off a Maxim's menu, du Paty de Clam, done up in a fake black beard, meeting Esterhazy in order further to incriminate the innocent Dreyfus.

Out of *The Affair*, to my mind, Dreyfus, never an engaging personality, rises with a dignified, tragic grandeur that surpasses previous images of him. His letters to his wife, Lucie, from Devil's Island are deeply moving: obsessed above all with having his honor restored, repeating his love for France, regardless of the wrong it had done him, he was always the dedicated French officer, never once mentioning the word *Jew*, despite the anti-Semitic insults that had been heaped on him. His faith in France, in justice, and simply in himself is awesome. How could anyone have survived those four years and three months, most of the time in shackles, solitary, locked in a double compound and unable even to glimpse the sea from the fever-ridden island?

When Dreyfus finally returned to France to face a new trial, his hopes were dashed when he was at once placed in a cell, isolated again from his family. But his military pride in the caste that had condemned him was still such that he had his uniform padded to conceal his skeletal condition and to "give himself a semblance of stature" at the Rennes retrial. Through the blundering of his lawyers, who were on the worst of terms with each other, he was again condemned, this time to ten years' detention.

Still Dreyfus, supported by his tireless brother Mathieu and the mushrooming (although increasingly divided) number of "Dreyfusards," somehow kept up his courage, sustained by "the unshakable faith that France would one day proclaim [his] innocence to the world." World reaction had meanwhile turned savage, with several countries threatening to boycott the forthcoming World's Fair in Paris. Finally the president intervened, pardoning Dreyfus.

Later Dreyfus was named a Knight of the Legion of Honor for his suffering. The decoration was bestowed on him in the same courtyard where he had been stripped of his rank years earlier; the parallel apparently provoked in him terrible nightmares. As a final petty meanness by the French bureaucracy, his time on Devil's Island was not allowed to count toward his pension. Even when it was all over, he continued to be tormented by the hostilities among the various Dreyfusard factions. But never once did Dreyfus evince any bitterness; throughout he regarded himself as "only an artillery officer whom a tragic error prevented from following his course" and a one-hundred-percent *French* officer. His Jewishness, Bredin tells us, concerned only his private life; he was not interested in the anti-Semitism aroused by his trial or in the profound changes it caused in the attitudes of French Jewry.

It was perhaps fitting that, as a French officer, he fought in the hell of Verdun in 1916, and that his brother Mathieu's grandson, Jean-Pierre, was killed after parachuting into France with the Free French in 1942—just seven years after the death of Dreyfus himself.

WHAT IS MOST remarkable about *The Affair*, more than the reinvestigation of the story itself, is the skill and sensitivity with which the author places it in its essential historical setting. In explaining the neurotic, indeed mad, behavior of the French army hierarchy, which seems inexplicable to the outsider, Bredin shows all wires leading back to that devastating defeat of 1871 and the even more devastating loss of Alsace-Lorraine to the greedy Prussians. *La revanche* was to preoccupy French minds for two generations, until 1914 brought the opportunity of regaining the lost territories—at an appalling cost. (For a modern example, albeit extreme, of what Alsace-Lorraine meant to France, think of the enduring fanaticism created by that other territorial grievance—Arab Palestine.)

Bredin quotes Raoul Girodet: "Never in our history was the prestige of military officers valued so highly as in the twenty-year period following the defeat." Well nicknamed the "Ark of the Covenant," the army came to believe that it was above the law. The jurors trying Zola were deeply moved by the appeal to emotion made by General Pellieux: "What do you want this army to become on the day of danger, which may be clos-

er than you believe?" Beyond this lay a frenetic patriotism. "I have never forgotten that transcending men, their passions, and their confusions, there is the country" was the creed invoked by another principal villain of the piece, General Boisdeffre, chief of the General Staff. (Incidentally, though Bredin does not mention the considerable relevance of this fact, Boisdeffre was also one of the principal architects of the secret pact with Russia, concluded the year of Dreyfus's arrest, which initiated the network of alliances that eventually made 1914 inevitable.)

By that critical year of 1894 the French army establishment had become a kind of religious order, with its own laws, rules, and rigorous loyalty to hierarchical convention—to which no one subscribed more closely than Dreyfus himself and his would-be savior, the courageous Colonel Picquart. The establishment was xenophobic and pathologically obsessed with spies; hand-in-hand with this went an inflammatory anti-Semitism. The full extent of this anti-Semitism in France in 1894, as whipped up by Edouard Drumont's *La Parole Libre* and similar organs, will be unfamiliar to many Anglo-Saxon readers, and Bredin performs a notable service in exposing it in depth, even in excessive detail. He also explains why many affluent Jews of the time, in their passion for assimilation, kept silent over Dreyfus: the poet Charles Péguy declared, "They were afraid of the blows. They had received so many."

What were the consequences of the Affair for France? Enormous. Across the nation it polarized attitudes, with the Dreyfusards, supported by the intelligentsia, seen as republican and progressive, standing for justice and individual liberty, and the army, partly monarchist and largely Catholic, dedicated to hierarchical and undemocratic order, tradition, and obedience. As the crisis deepened and the army closed its ranks against external attack, so it seemed to stand further and further apart from the rest of the nation. It emerged from the Affair greatly weakened, and Bredin possibly loses some points in failing to indicate just how much this weakness contributed to the disaster of 1914, not least in the temptation it provided to Kaiser Wilhelm to take risks that he might otherwise have thought twice about. (I also find myself in mild disagreement with the author over his claim that the Affair brought the final collapse

of monarchist hopes in France; that collapse had, in effect, already been sealed by 1870–1871.)

For world Jewry, the consequences of the Affair were historic. As Bredin observes, the anti-Semitism it threw up made Dreyfusards like Bernard Lazare and Theodore Herzl (who—I had not known—was among those who witnessed the degradation ceremony of Dreyfus) realize that the dream of assimilation was a lost cause, and begin to see the necessity of creating a Jewish state.

Down to contemporary France the Affair continues to throw its shadows. Even during the Algerian war of 1954–1962 "the honor of the Army was seen to absolve summary executions and national interest to excuse torture," Bredin writes. "Those who dared to cast doubt on the nation's exigencies were accused of treason." The polarization that had occurred for the first time during the Affair was repeated as intellectuals collectively committed themselves against the army in Algeria and the war. Even today, in the extraordinary Greenpeace affair, there are echoes of *raisons d'état* and of the army's closing ranks in a way that could perhaps not occur in either Britain or the United States. The recent recrudescences of anti-Semitism in France lend Maître Bredin's book an added timeliness. Altogether, it makes for essential reading for anyone seeking to understand modern French history, or even the underpinnings of French society today. It is also a gripping—though terrible—story superbly told. □

WRITING FOR THE VIDEO AGE

BY JACK BEATTY

PROVIDENCE

by Geoffrey Wolff. Viking, \$16.95.

SUPPOSE IT FELL to you to pick a book to go into a time capsule labeled "Not to be opened until the year 2086"—a book that would preserve for posterity a specimen of contemporary prose at its best. What would you pick?

The criterion, I should stipulate, is not greatness or brilliance but style, and style not in the abstract but understood as capturing something essential about this time, the way waistcoats and ceiling medallions capture the very quick of the

Victorian Age. Ann Beattie's stories might represent an interesting slice of our capacious society, but her "I am a camera" style, though it works well enough in her fiction, lacks one of the marks of the contemporary self—an element of willful eccentricity. Something by John Updike would go in, if your aim were to impress the future, but that's not the aim; and, in any case, Updike writes with a lushness that belongs more naturally to the Belle Époque than to our comparatively costive time. V. S. Naipaul? Yes, if political anxiety were what you wanted the future to know us by. But Naipaul is more an idiosyncratic genius than a writer who can represent his age before the tribunal of time. If you wanted to bequeath to the future an example of the possibilities of prose—and especially of American prose—you would do well to pick this new book by Geoffrey Wolff, the veteran novelist and literary man best known for his book about his father, *The Duke of Deception*.

Sentences like these, an inventory of objects stolen by a Providence hoodlet, are why I would make that choice:

Here were some things Skippy took: copper wire (when copper was trading high), the fiberglass top for a Corvette, chrome wheel lugs from a Z-Car (sad surprise for some driver), Pampers (a truckload), three hundred cans of sardines, barbells, mink pelts, a set of bagpipes, a Denver boot, other things too. He'd steal the paint off your house.

Now, that's just a list. No fancy footwork there at all. Still, note the latent artfulness. A writer less deft would have ended this survey of Skippy's swag with the Denver boot, but Wolff throws that line away with a shrug—"other things too"—so that we have time to get the joke before we move on to the next one, the hyperbole at the end: "He'd steal the paint off your house." This is writing in the teeth of the video age. No camera could capture these objects with this wit and flavor.

Here's more:

Skippy and his brother Mike grew up good boys, played football, basketball, and baseball at St. Anselms, graduated. Well, Skippy almost graduated. He figured he got booted for quitting the baseball team. Well, spring term of his senior year he got in some trouble, but he was basically a good boy.

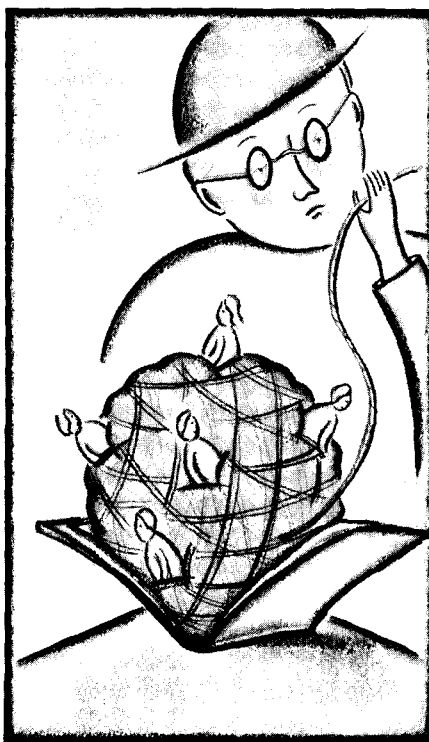
Easy to parody, but try giving information so intrinsically dull as entertain-

ingly, or with as much inflection of tone. The prose takes on some of the attributes that character has in a more old-fashioned novel: it battles truth right before our eyes, and loses.

A final example—this one a little fancier:

And then he heard above the talk of *Warlock's* timbers and the complaint of her rigging sea-noises he had long imagined: the rusty-hinged creak, a great sound of breathing, the squawky click of whales.

The first clause has a Miltonic sprung rhythm to it. We have to let twelve words after "heard" go by, our expecta-



tions building, before we discover *what* was heard. The sensation of delay brings (literary) pleasure. "Rusty-hinged creak," a familiar enough phrase, domesticates the sound, brings it closer to us. But "squawky click," exotic to the point of bafflement, restores the strangeness and then some. The whole passage enacts the action it describes; it becomes an encounter with the uncanny. Wolff has given us a bookful of such touches.

PROVIDENCE TAKES place in the eponymous city well known for harboring Brown University, the Rhode Island School of Design, and a congeries of crime bosses who seem to have been put on the planet solely to prove Oscar

Wilde right about the relationship between art and life. The title is also a pun, something like providence (fate, say) being what brings five diverse characters together in a taut novel that is part crime story, part melodrama, part criticism of life, and part tragedy. The book asks, In the 1980s what are the forces that can take over a human life and send it smash against the rocks? It answers, Cancer, psychosis, sex, and crime.

Adam Dwyer, forty-six, a criminal lawyer descended from Rhode Island slavers and clipper-ship captains—Adam Dwyer, husband of Clara and father of Ike, discovers in a bizarre epiphany that he has leukemia. His doctor-brother, Asa, visiting to celebrate Ike's fourteenth birthday, needs a sample of blood to test the microscope that he has just given Ike. Adam obliges.

Asa bore down hard against the eye piece, and when Ike asked a question, he got no reply. When Ike shoved close to see what was so interesting, he was gently waved away. So it came about that Adam, slouched in the deep cushions of a chair his father had also favored, watched himself sentenced to death.

Adam's troubles soon increase, when Skippy Carbone, accompanied by a cretinous companion in crime, slips through the basement window as easily as you might put on your pants. They plunder the Dwyer home while Clara and Adam sleep their troubled sleep. Wolff's prose exerts itself in the direction of the macabre with Skippy, here caught eyeing a picture of Adam and Ike—man and boy, flanked by fish—on the piano in the living room.

He'd read in *True* about fly-fishing, when he was a kid. Himself, he'd used worms. And if that didn't work, blasting caps.

What's most frightening about Skippy is that he is not one of those creatures of "motiveless malignity" who inhabit our nightmares and spill blood over our newspapers. He is a criminal because crime pays—gives him money and status. Shakespeare would not find his type interesting, but Adam Smith might. Skippy's debased rationality, one realizes with a start, is common sense itself in a society in which the benefits of crime have been allowed to exceed the costs by a scandalous margin.

Skippy and his pal make off with nearly all of the Dwyers' now poignant memorabilia, and Adam and Clara go to

the police station, desperate to get it back. There they meet Lieutenant Thomas Corcoran, the penultimate character to step into the frame.

Corcoran is in a clown suit when they arrive. His daughter, years before, was horribly burned in the kind of accident that gives Providence a bad name. Volunteer clowns from the Shriners, visiting her at the Boston Shriners Burns Institute, had made her laugh. So Tom, too, became a Shriner and took training as a clown. A good man, a family man. Yet a little later in the novel a scene that begins "He'd just left the 19th Hole figuring to go home" ends with him in the bar of the Biltmore Hotel, licking a mote from the eye of Lisa—the last major character to be introduced and the agent of Tom's deliverance from mere unhappiness to utter disaster.

Lisa is a frightening apparition. She seems to have wandered into Providence from Nathanael West's Los Angeles. Possessed of a vacuum-cleaner mind in which nothing can stick for long against the next whoosh of sensation-orgasm, blast of drugs, she is a little study in the pathology of boredom: an emblem of the eighties, a plugged-in, freaked-out nullity. Tom nevertheless goes for her. Over the succeeding summer nights of strenuous canoodling in musky Biltmore rooms he dreams of escaping to Mexico with her. She, meanwhile, has plans of her own. She snuggles him into copping cocaine for her from the police department's evidence room. And she happens to be Skippy's girlfriend. In a novel titled *Providence*, such coincidences do not strain belief.

Nor does it strain belief that Skippy, needing money to escape the Mob (he has robbed a house sacred to the affection of the local capo), should break into the Dwyers' again; that Clara should, this time, be there alone (enter psychosis); that Tom, guilt sapping his sexual energy, should conceive a homicidal hatred for the ever-turgid Skippy; that Lisa should grow bored with Tom; and that, through a chain of events bloody and grim, Adam Dwyer, cadaverous from his cancer, should be the attorney assigned to defend Skippy Carbone against a charge of murder in the first degree.

The plot, not to put too fine a point on it, catches you by the throat. The subtlety in *Providence* lies elsewhere—in the asides about fate and freedom, in shrewd bits of observation, dialogue,

and description, above all in the writing. It includes multitudes, the writing does: wisps from the old masters, the latest burble from pop culture, media noise, drug talk, Valspeak East—everything is here except political wind. "We may not all have lived this way," I'd write in the note to be put in the time capsule, "but this is how we wrote when we tried to render in words and rhythm the intensely serious low comedy of this age." □

BRIEF REVIEWS



COASTER by George Foy. Viking, \$16.95. Penrose, skipper and principal owner of a British coastal freighter, has lost the ship through no professional error, and Lloyd's, for no comprehensible reason, refuses to pay the insurance claim. The indignant captain sets out to learn why and precipitates an uproar. He is beaten up, blown up, shot at, trampled, kidnapped—there seems no limit to the ingenuity with which Mr. Foy elaborates the unlikely Perils of Penrose. The financial villainy underlying this giddy thriller is, by the way, disconcertingly plausible.

SHACKLETON by Roland Huntford. Atheneum, \$29.95. In 1909 Ernest Shackleton got within approximately a hundred miles of the South Pole—closer than anyone had previously reached—and had the good sense to turn back, because, as he told his wife, "a live donkey is better than a dead lion." In 1914, as the First World War broke out, he led a second expedition south, proposing to cross the Antarctic continent. He wound up losing his ship in the ice but brought his party safely out through one of the longest and toughest open-boat voyages known to history. This may seem like a record of failure, but in fact each of Shackleton's ventures produced valuable information about south-polar conditions and how to cope with them. Personally, Shackleton combined an urge for action with a passion for poetry (he could quote Browning by the page and did, regardless of audience reaction), honest intentions with a con man's persuasiveness and guile (his brother was a con man in a discreet stocks-and-business way), and improvident recklessness with

some highly sensible innovations (he hired a nutritionist to work out a scurvy-proof food supply, and casually originated what is now called container shipping). Mr. Huntford has done a splendidly thorough job of re-creating Shackleton and his associates. As the biographer builds up his portrait, one experiences an odd sense that one has met this man before—but where? Of course—this is Odysseus. Not Tennyson's prettified horizon-chaser but Homer's daring, wily, resourceful, indomitable survivor. In one respect Shackleton even bettered Odysseus: no man ever died under his command.

THE RIDDLE OF THE DINOSAUR by John Noble Wilford. Knopf, \$22.95. The actual subject of Mr. Wilford's ably written book is not the dinosaur as such but the various, sometimes eccentric, scientists and bone hunters whose theories and discoveries have led to what is currently known about the creature. Even if one does not particularly care for dinosaurs, the story is an impressive illustration of the trial-and-error, jigsaw-puzzle way in which the remote past can be reconstructed.

ART NOUVEAU by Jean-Paul Bouillon. Skira, \$60.00. The diarist Edmond de Goncourt, who detested the stylized swirls of Art Nouveau, quoted the painter Raffaelli on "the moral perversion generated by these Anglo-Saxon pieces of furniture and the spread of sodomy encouraged by Liberty fabrics." The notion would have startled those architects, artists, and craftsmen whose avowed intention was to create fine objects in terms of the material used and the purpose to be served, and then to make those objects available to a wide public. In that last objective they failed completely. Art Nouveau products were always extremely expensive and reserved for a financial and aesthetically liberal elite. Professor Bouillon's study of the movement and its practitioners is handsomely illustrated and very well constructed, revealing clearly the international network of theory and action that from 1870 to 1914 could encompass everything from a mustard spoon to the School of Art building in Glasgow.

SCRAMBLE by Norman Gelb. Harcourt Brace Jovanovich, \$22.95. Give or take a bit of argument, the Battle of Britain lasted from July 10 to October 31, 1940, and in those 114 days the pilots of the RAF, although outnumbered, insufficiently equipped, and often very poorly trained, stood off the Nazi attempt to bomb Brit-

Answers to the January Puzzles

"UPSTAIRS DOWNSTAIRS"

Across. 1. STORIED (double def.); SH(AFT)-ED 5. SPARS-E; BOAR(D)S 10. TANG-O (rev.); CAP-ON 11. COUP(L)ES; SE(N)E-GAL 13. ORES (homophone); A LA-N 15. S(CH)OONER; CUCUMBER 17. WEEK; LO-RE 18. CON-SIDE-RATION; GENERALISSIM-O (anag. + o) 19. WEE-DER (*red* rev.); MO(on)-ROSE 20. PL(I)ANT; TIT(I)AN *Down.* 1. ST(ODG)Y (*dog* anag.); SCAR(C)E 2. T-ALLOW; HAR(L)EM 3. O-PAL (*lap* rev.); ANEW (homophone) 4. TORE-RO (*or* rev.); IN-GRID 6. PEON(y); O-PUS (rev.) 7. A-L(M)OST; A-GOUT-I 8. RE-BB; RANK (double def.) 9. SERMO-N (anag. + n); ERRANT (hidden) 12. LE(M)ON (rev.); S(ELM)-A 14. NOSE (homophone); SE(v)ER 16. (s)HARP; C(H)IT

S	H	A	F	T	E	D	B	O	A	R	D	S
T	A	N	G	O	C	O	U	P	L	E	S	E
O	R	E	S	R	C	U	C	U	M	B	E	R
D	L	W	E	E	K	B	H	S	O	S	L	M
G	E	N	E	R	A	L	I	S	S	I	M	O
Y	M	O	R	O	S	E	T	I	T	I	A	N
S	T	O	R	I	E	D	S	P	A	R	S	E
C	A	P	O	N	S	E	N	E	G	A	L	R
A	L	A	N	G	S	C	H	O	O	N	E	R
R	L	L	O	R	E	K	A	N	U	K	M	A
C	O	N	S	I	D	E	R	A	T	I	O	N
E	W	E	E	D	E	R	P	L	I	A	N	T

ACROSTIC NO. 6

"The roar of the Twenties was discordant, a raucous cacophony of wailing saxophones and snapping fingers and feet stamping the Black Bottom, staccato of guns in a Chicago gang war, crash of broken bottles in a Prohibition raid."

—Corey Ford, *The Time of Laughter*

ain into submission. Mr. Gelb's "narrative history" of the battle depends for the most part on the recollections of pilots, ground crews, nurses, and bystanders. The voices range from the eloquent to the grimly terse, the events from the horrifying to the comical. Everything testifies to the courage of the young men who went up, sometimes four or five times in a day, to fight with the odds always against them. Courage, but not stupidity.

BIGGIN HILL CONTROLLER SQUADRON LEADER BILL FRANKLAND: Twenty-four bombers, with twenty plus more behind them.

32 SQUADRON CO SQUADRON LEADER JOHN WORRALL: Got it.

FRANKLAND: Twenty plus more bombers and twenty fighters behind and above.

WORRALL: All right.

FRANKLAND: Now thirty more bombers and a further hundred-plus fighters following.

WORRALL: Stop. No more information, please. You're frightening me terribly.

GERALD'S PARTY by Robert Coover. *Linden, Simon & Schuster, \$17.95.* Gerald, the narrator of Mr. Coover's novel, is giving a cocktail party at which a cross section of the population indulges in a night-long orgy of food, drink, bungled copulation, murder, and metaphysical prattle while Father Time cracks bad jokes and the plumbing breaks down. The cocktail party as a metaphor for the ills of society or whatever must have seemed a promising idea to the author, but the result warrants a paraphrase of Kipling's Devil: "It's boring, but is it Art?"

BLOOMSBURY/FREUD: The Letters of James and Alix Strachey edited by Perry Meisel and Walter Kendrick. *Basic Books, \$21.95.* James Strachey was brother to Lytton and in consequence a fringe member of the Bloomsbury aesthetic group. Both he and his wife, Alix, however, applied themselves to the study, and eventually the practice, of Freudian psychotherapy. This purpose required, of course, that they themselves be analyzed, and in 1924 Alix went to Berlin to undergo the process. The letters that she and James exchanged during her months abroad will interest readers curious about the development of the Freudian school in England and also readers for whom no amount of Bloomsbury gossip can be too much. Lesser breeds will find the correspondence only moderately rewarding.

—Phoebe-Lou Adams



The Atlantic

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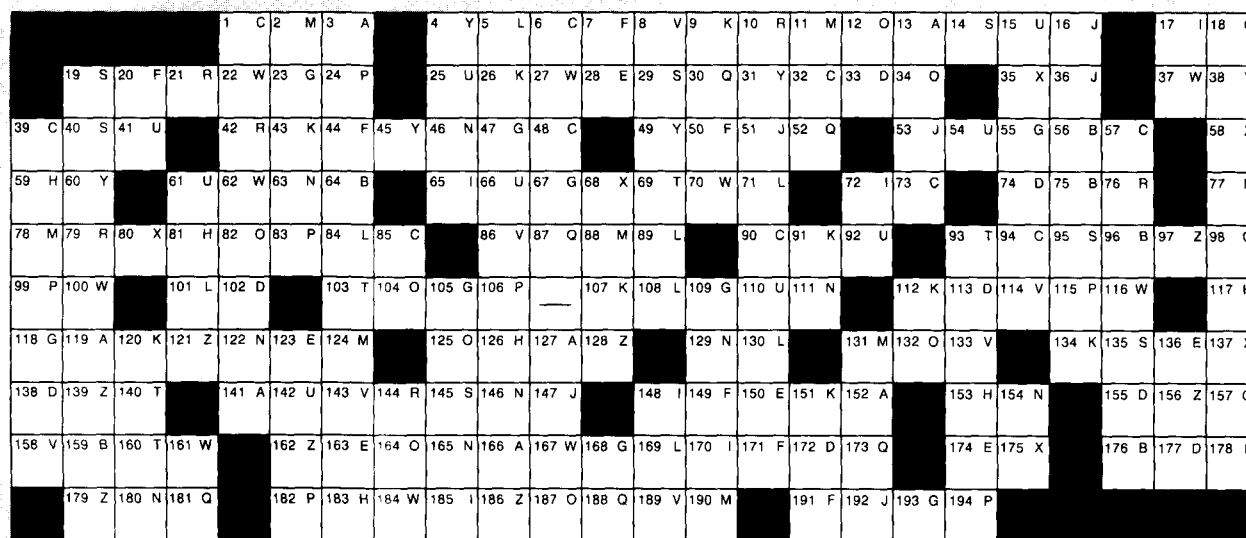
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ACROSTIC No. 7

BY DOROTHY OSBORNE

The letters of clue answers, when put in the appropriately numbered squares, will spell out a quotation.
The first letters of clue answers spell the source of the quotation.



The solution to Acrostic No. 6 appears on page 88.

A. Newspaper

152 119 166 3 13 127 141

B. Hammarck's
successor
(2 wds.)

96 176 75 159 56 64

C. Elvis Presley song
of 1969 (3 wds.)

32 73 1 39 85 57 90 94 48
6 18

D. Moravian-settled
town of
Pennsylvania

102 113 155 33 172 138 74 177

E. Eponym of a U.S.
aircraft carrier

123 174 28 150 136 163

F. Where the Philis-
tines captured the
Ark (hyph.)

20 191 7 44 178 171 149 50

G. Plum brandy

67 105 47 23 193 109 55 118 168

H. Ten-legged
crustacean

117 59 183 126 153 81

I. Filled pancake

148 65 72 185 17 170

J. Moon of Uranus

192 53 147 36 51 16

K. Ulster Protestants

26 120 91 112 107 43 9 134 151

L. Extra-large (hyph.)

89 108 84 71 130 101 169 5

M. Energetic (3 wds.)

190 11 131 2 78 124 88

N. Hungarian rhapso-
dist (2 wds.)

46 154 180 111 129 146 122 63 165 77

O. Hornbeam (2 wds.)

125 187 98 157 82 132 12 164 104 34

P. Painter of South-
western motifs

83 194 24 115 182 106 99

Q. Punic Wars
combatants

30 87 52 173 181 188

R. Able to touch one's
toes

79 10 144 42 76 21

S. Utterly reject
(hyph.)

19 29 40 145 95 14 135

T. Part of a staircase

93 69 103 140 160

U. New York State's
motto

54 142 25 110 61 92 66 15 41

V. Legislative or
judicial hall

189 158 143 114 86 133 8

W. Shelley poem

37 167 161 27 62 70 100 22 184 116

X. Star gymnast of
1984

137 80 58 68 35 175

Y. Go over, in a sense

4 60 49 45 31 38

Z. Artistic
sentimentalism

179 186 128 139 156 97 121 162

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THE PUZZLER

BY EMILY COX AND HENRY RATHVON

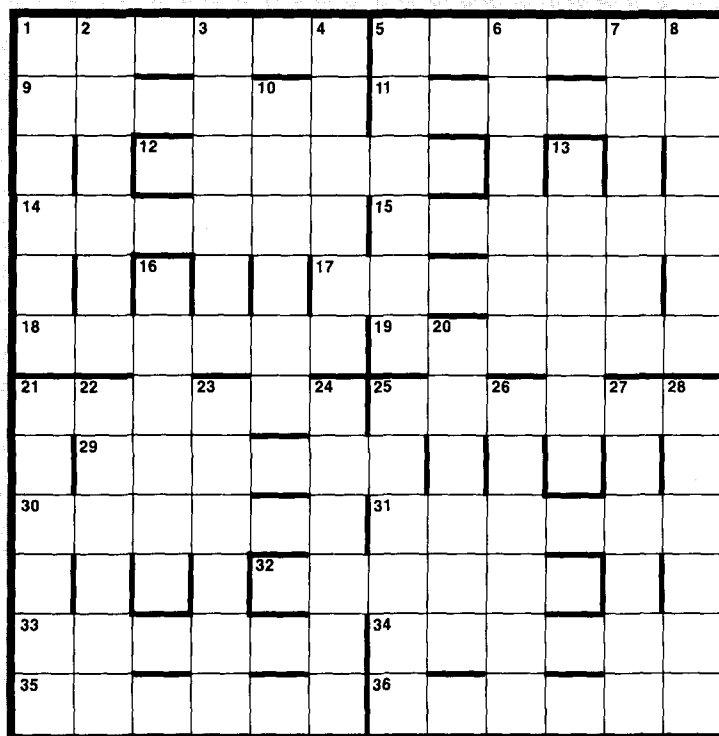
SIXISM

Twenty of the clues given below lead to five-letter words, while the other twenty lead to seven-letter words.

However, in the interests of equality, all words are to be made six letters long before being entered in the diagram. Each seven-letter word may have any one of its letters dropped to form a new word, and each five-letter word may have a letter added anywhere to form its new word.

Clue answers include a variant spelling at 34 Across and two proper nouns.

Diagram entries include seven proper nouns.



*The answers to last month's
Puzzler appear on page 88.*

ACROSS

1. Planet with hot, wet land
5. Don't start broadcasts for so long
9. French saint during day is armor-clad fighter
11. Stop carrying rod and whip
12. Amateurs wager about it
14. Sound of auctioneer's call gripping one
15. Devouring a container of cookies, ask for punishment
17. Fish that miss hoop
18. Apprentice left with paid worker
19. Thin lens distorted and reflected part of the rainbow
21. Bugs in average American car
25. In your voices, temper
29. Bringing up one fault in sleazy newspaper

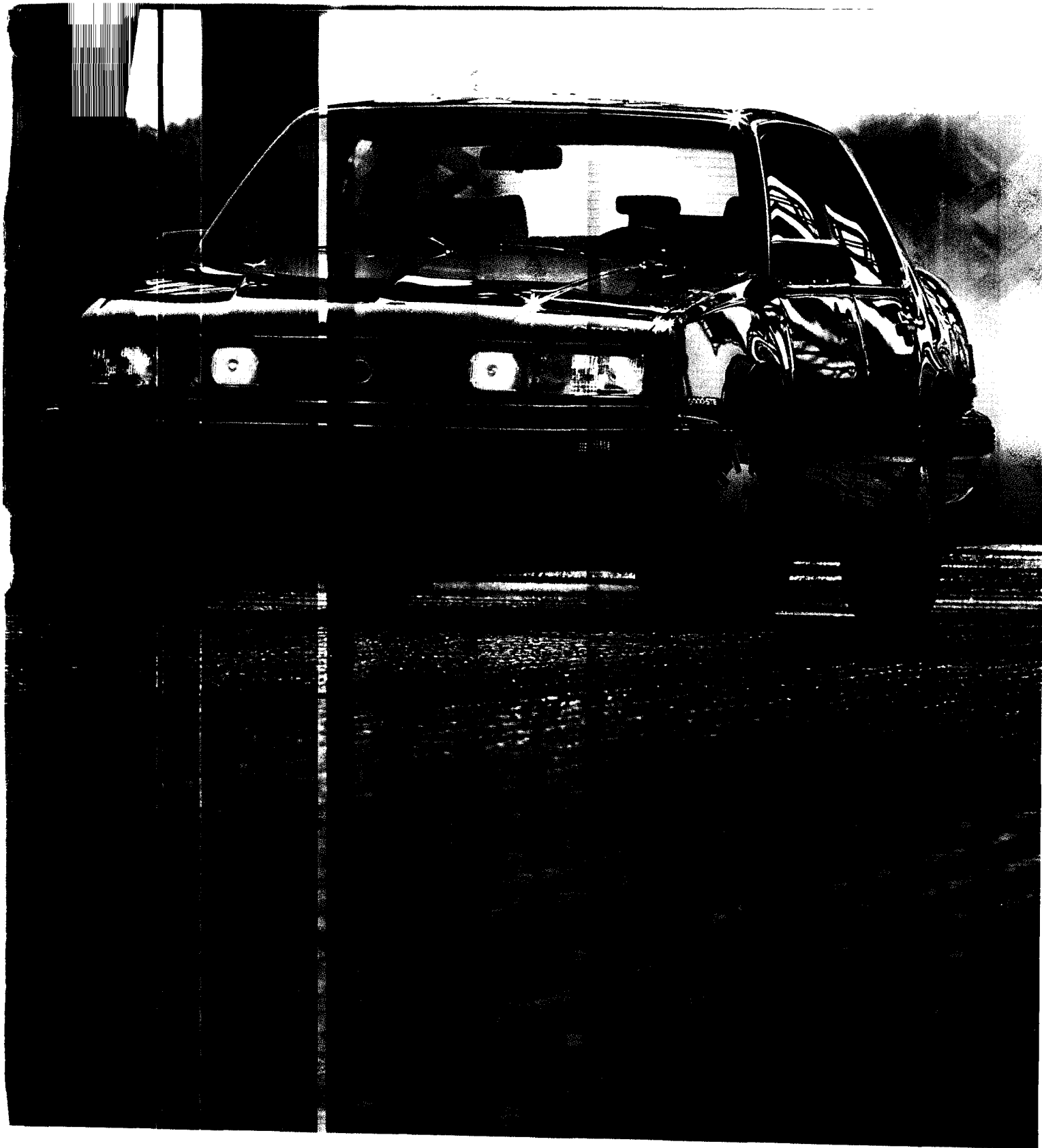
30. Went over cryptic grid in the sack
31. Doctor letter with varnish
32. Petitions for some Indians announced
33. Christian let Inge free
34. Roman magistrate's predilection, in part
35. Dumbbells weigh slightly short
36. One German passion

DOWN

1. Curve described by superior inventor
2. Nut set loose—in other words, free
3. Laurel found around one spot
4. Current passenger is more bitter
5. Those who shape wheels
6. Excavated around street in cleanup work
7. Stove operated by appliance corp.

8. Celebrity holds back urge to shock
10. Rolling dice, Tex is hot
13. Does trendy drugs at first in high school
16. British commercials for nails
20. Guaranteed result keeping new user
21. Cloak-and-dagger groups dropping third sources
22. Middle America reviewed wrongdoing
23. Cruel captain's grabbing first of the scourges
24. Fritters (50) consumed by mid-month
25. Dined out with old partner, getting in the back pages
26. Having a fit, third-year student gets a taste of educator's ruler
27. Fix lever so poorly
28. Be sore about a gourmand

Note: The instructions above are for this month's puzzle only. It is assumed that you know how to decipher clues. For a complete introduction to clue-solving, send an addressed, stamped envelope to The Atlantic Puzzler, 8 Arlington Street, Boston, Mass. 02116.



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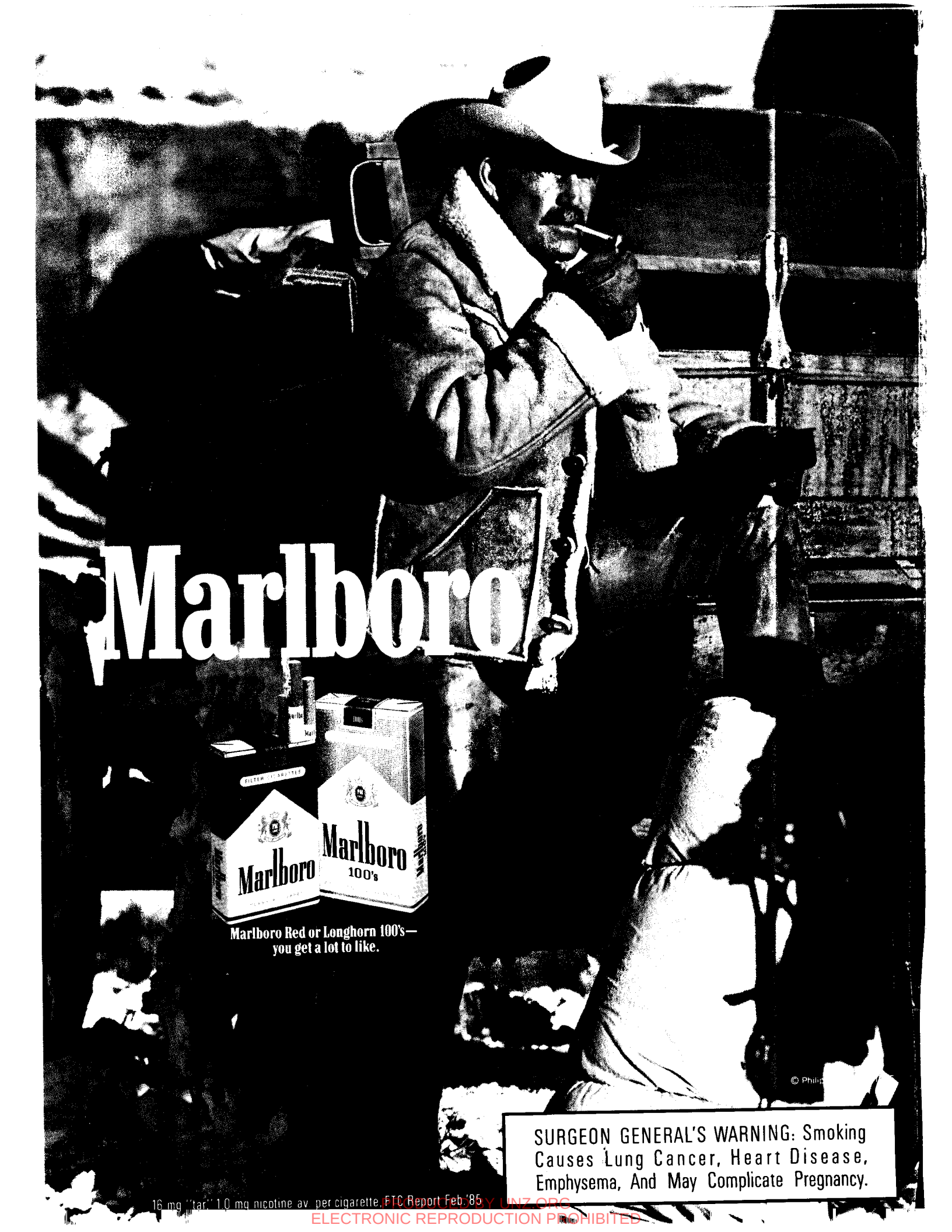
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